ELECTRICAL REVIEW

FOUNDED 1872

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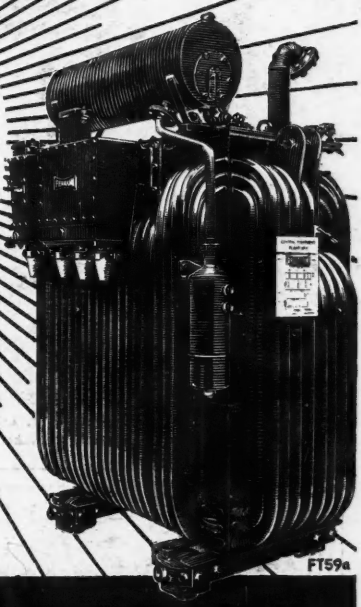

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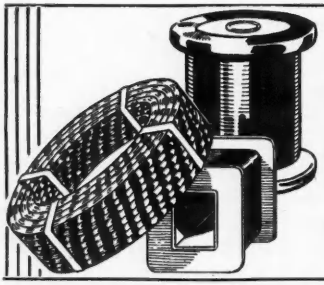

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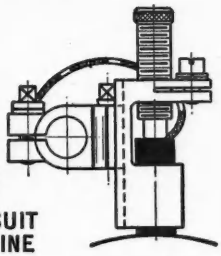

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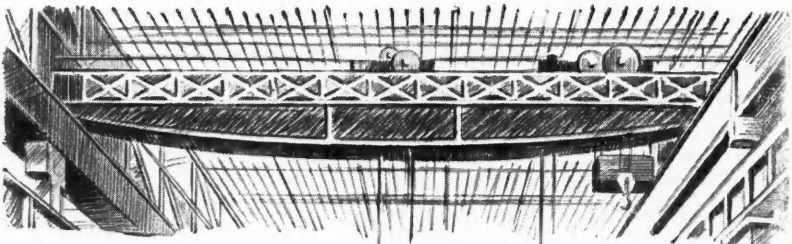

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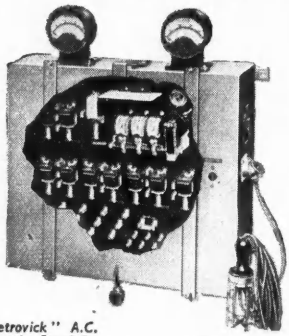

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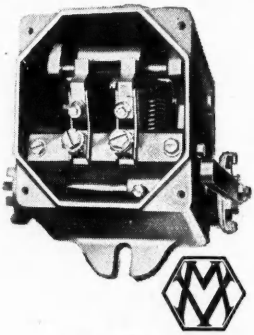

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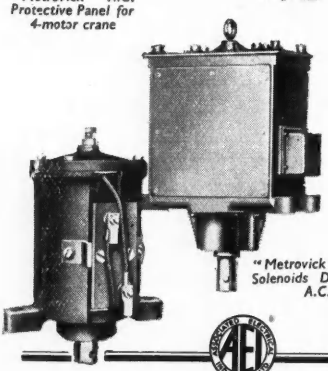

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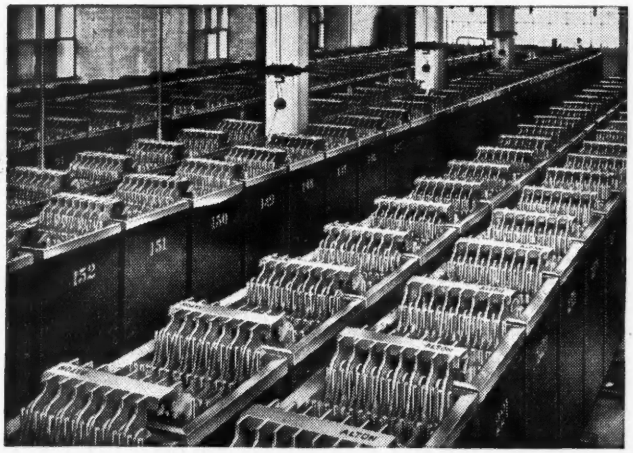

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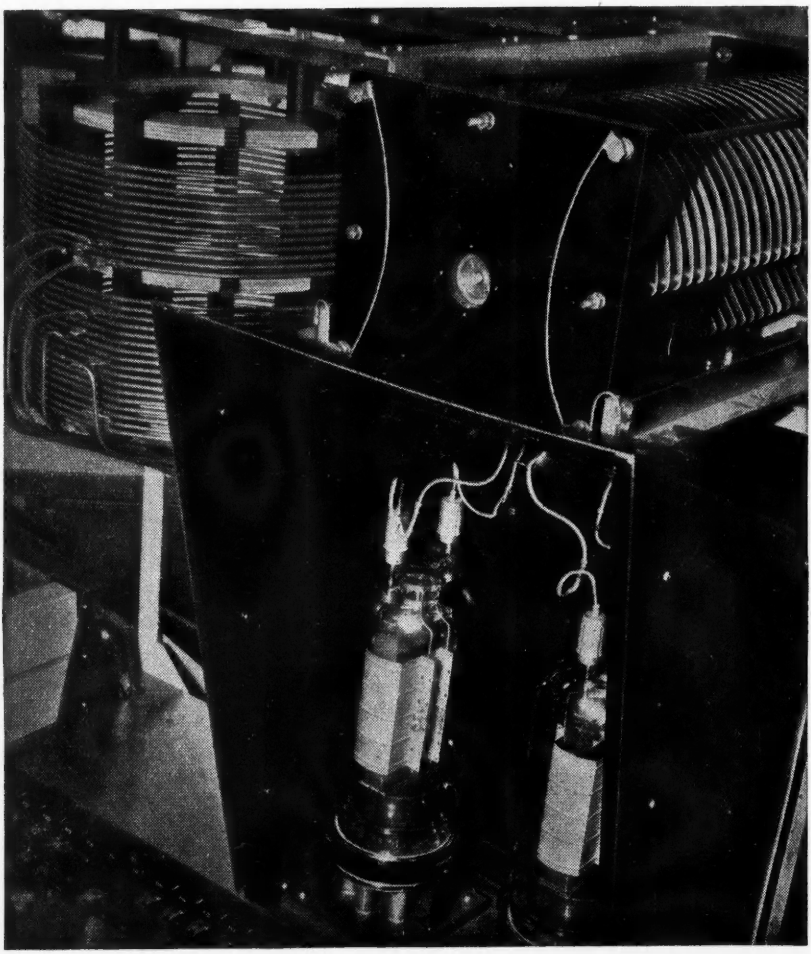

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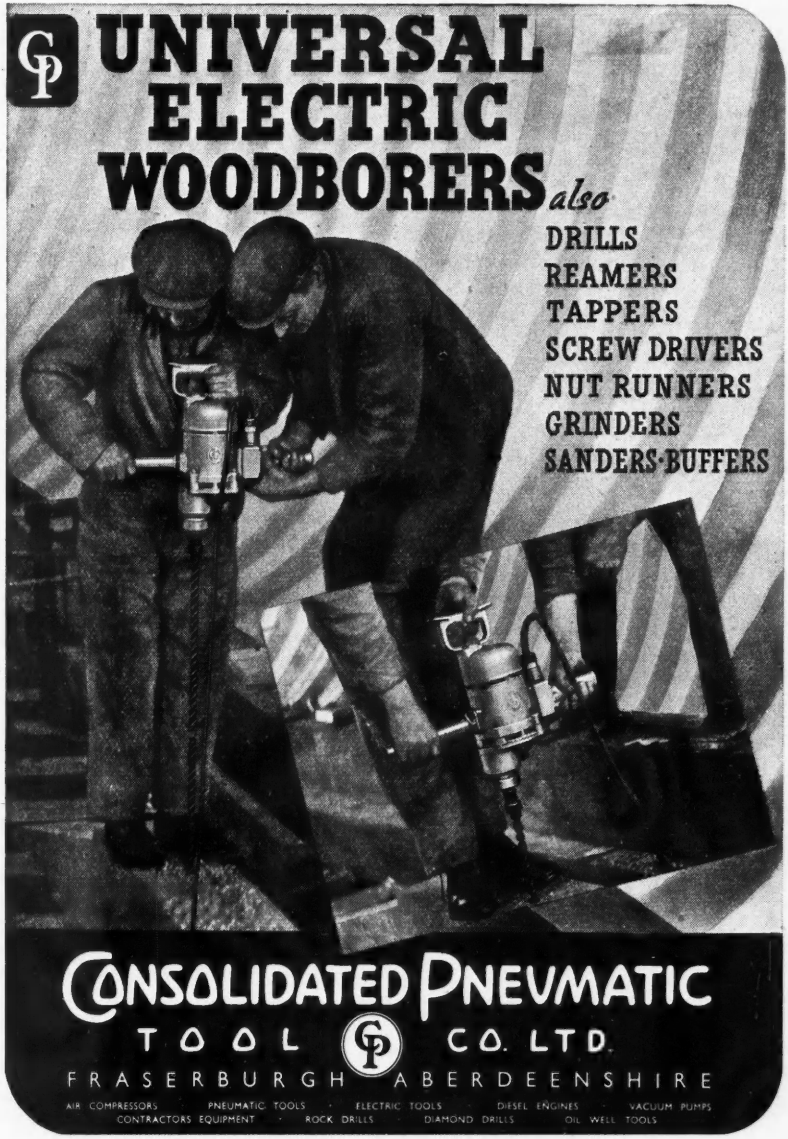
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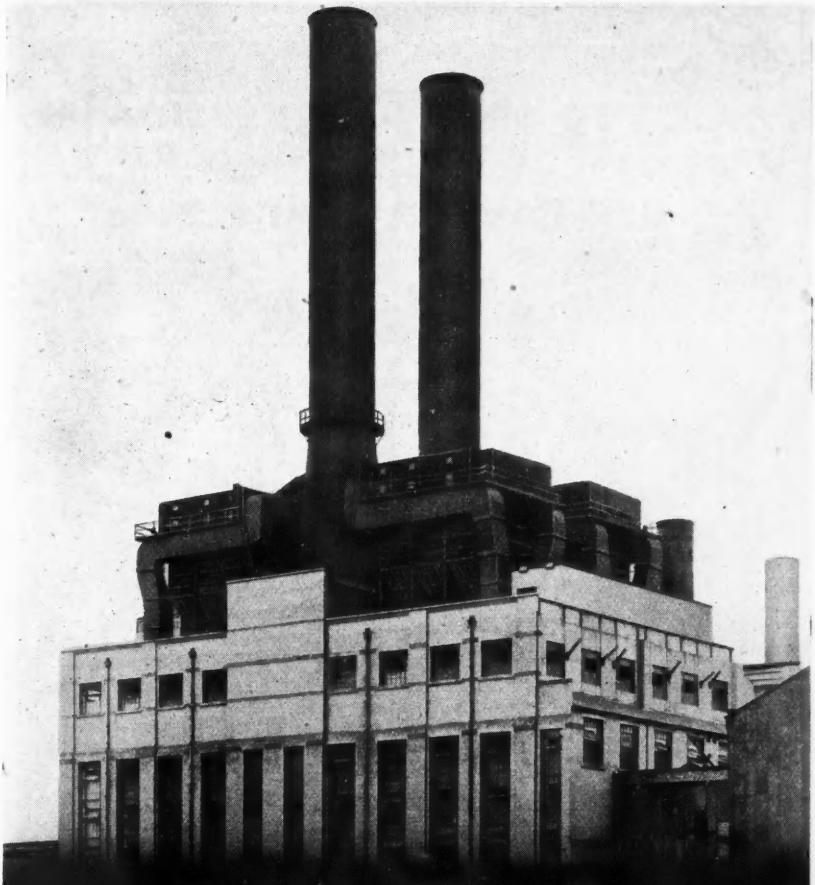

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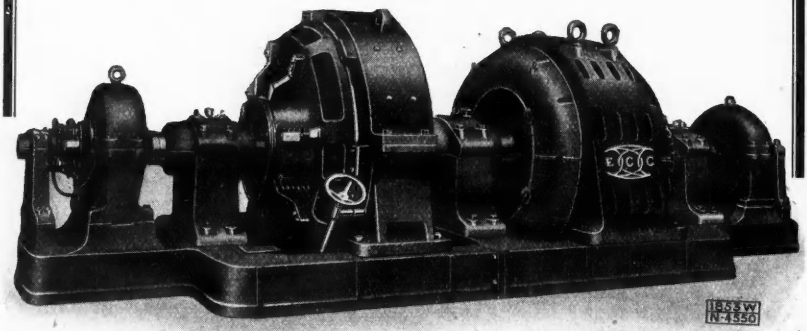

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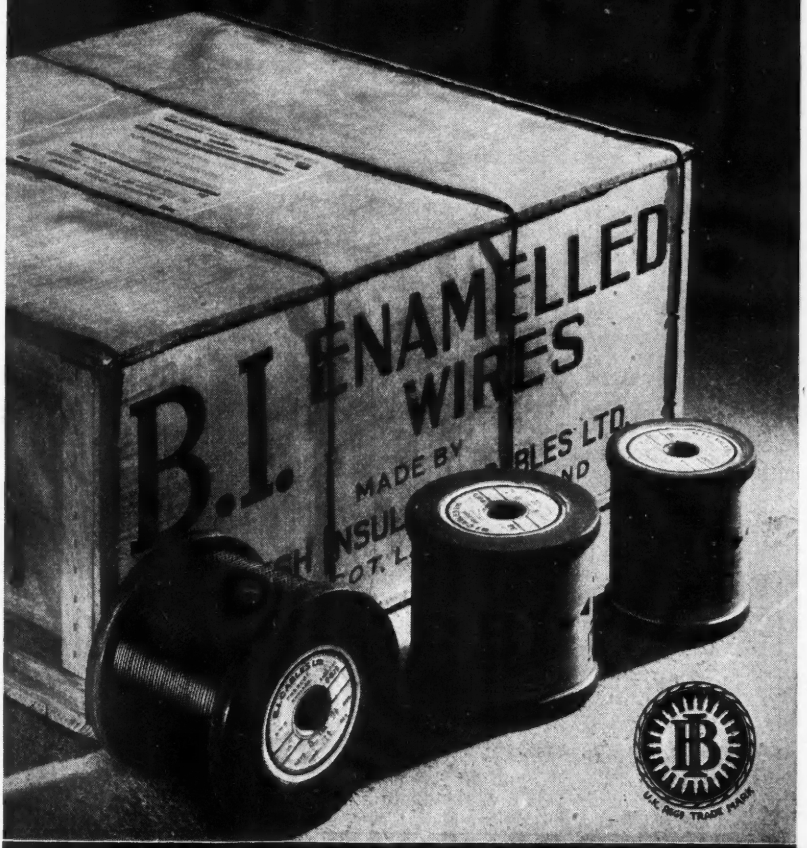

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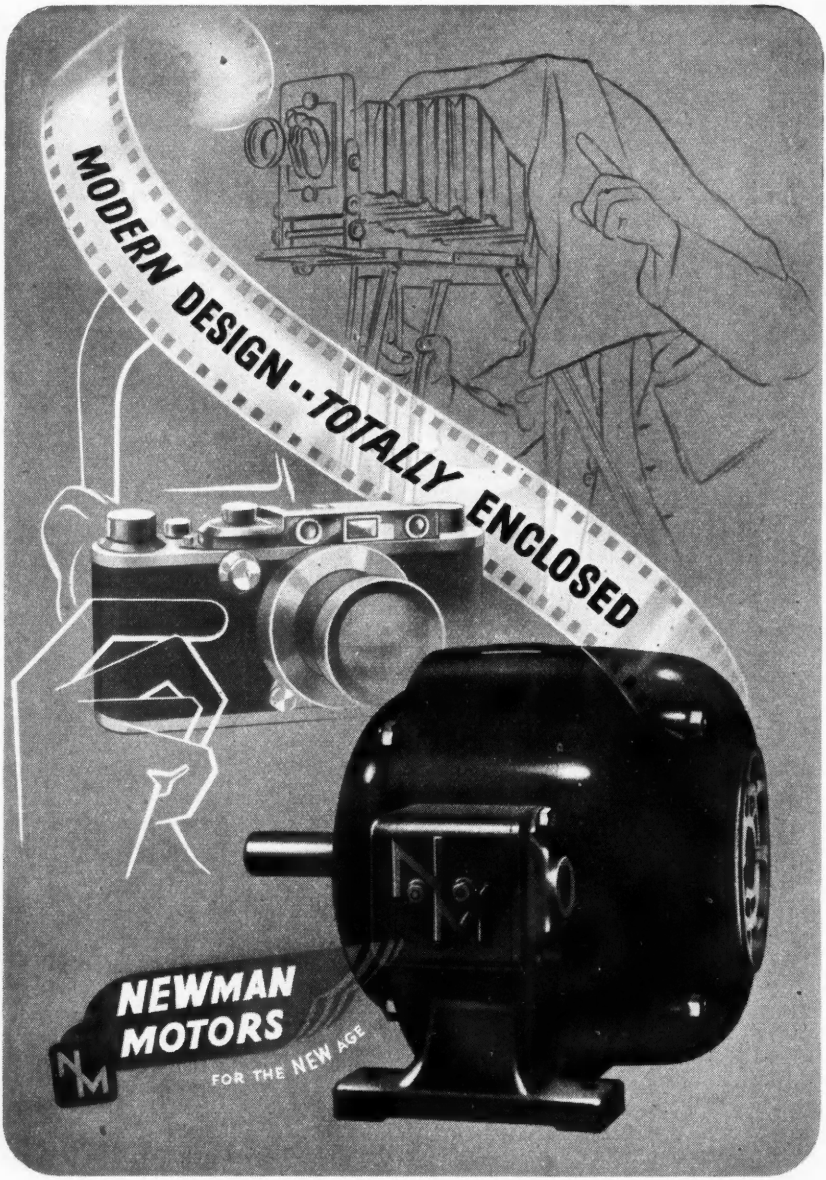

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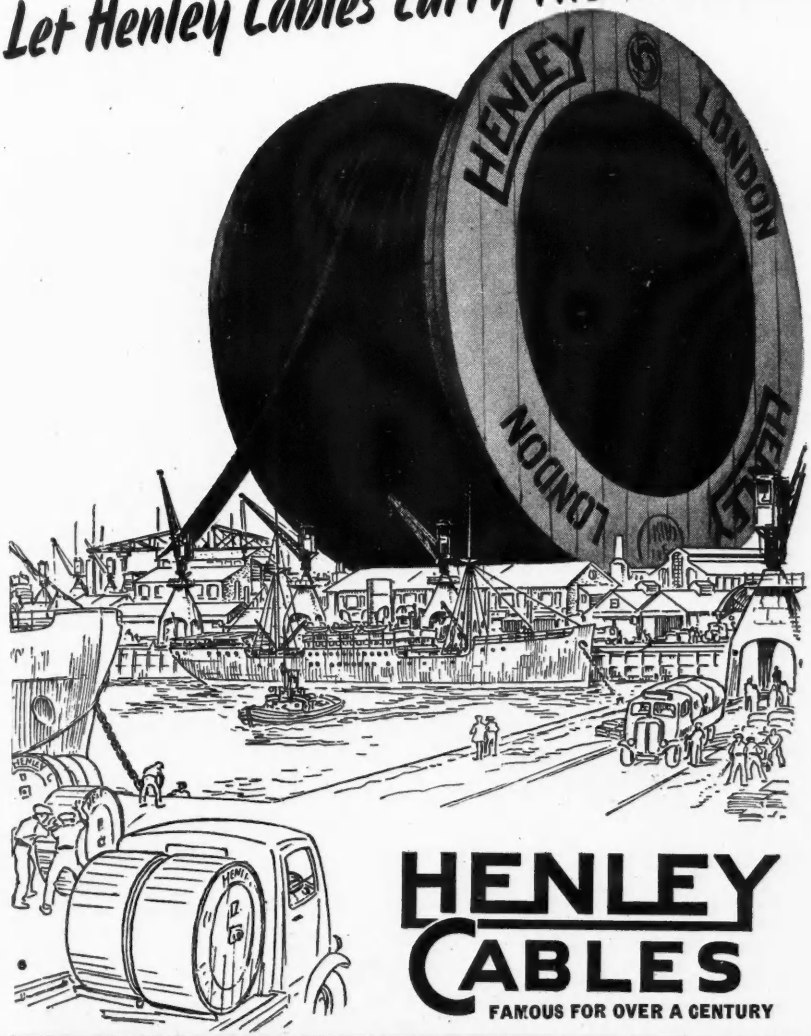

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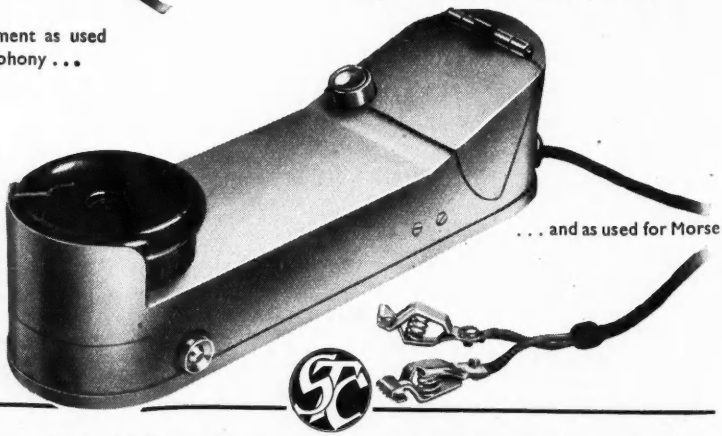

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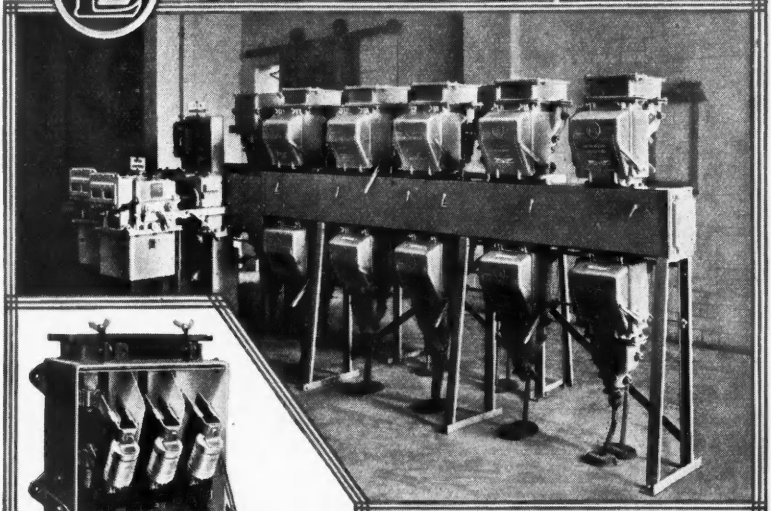

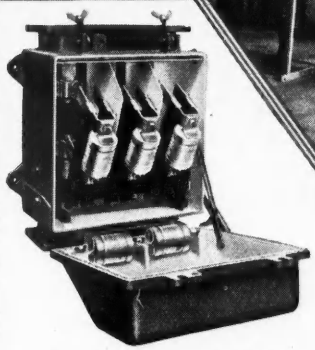

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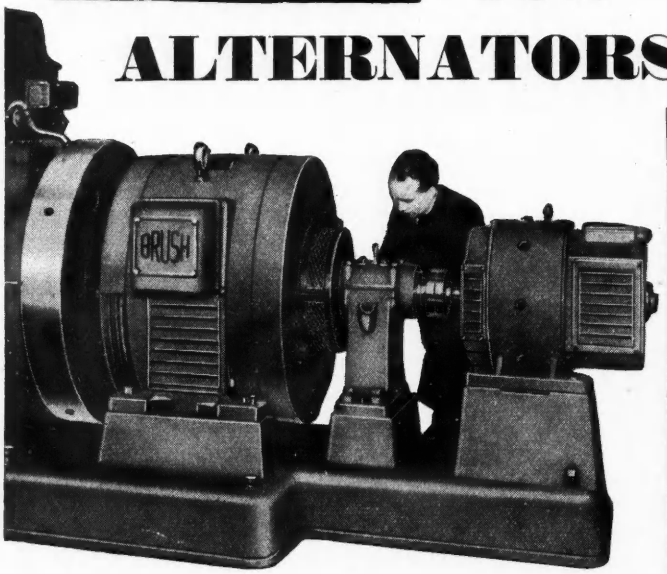

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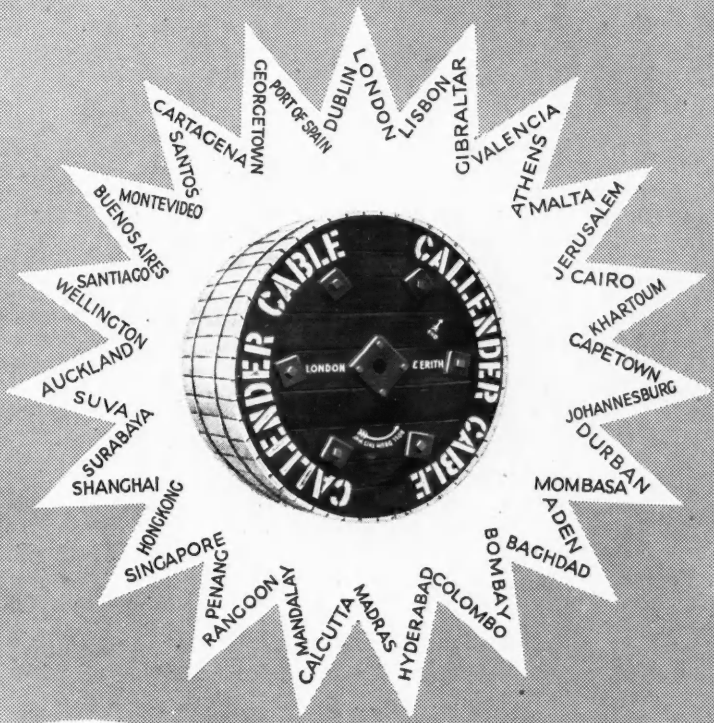

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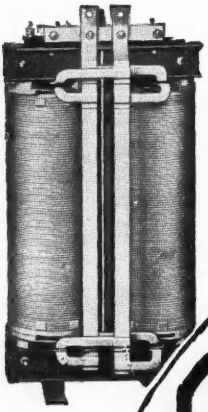

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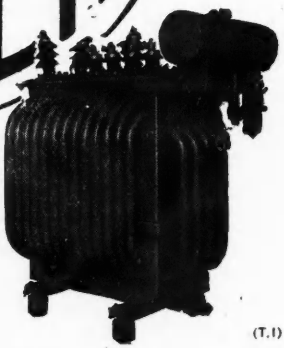

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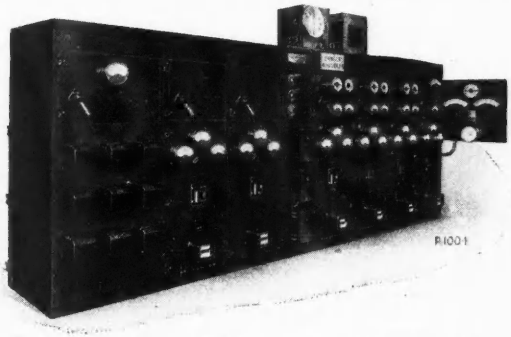

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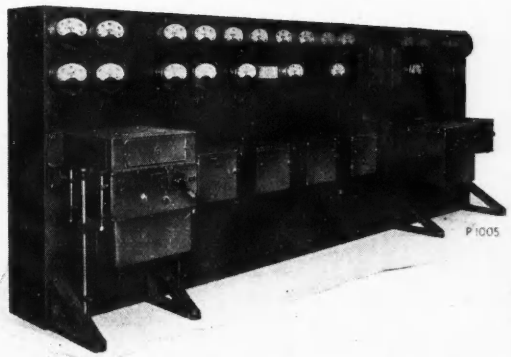

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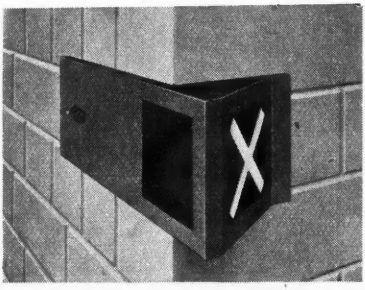

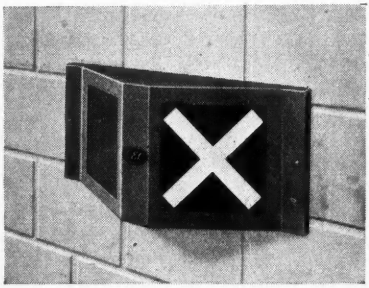

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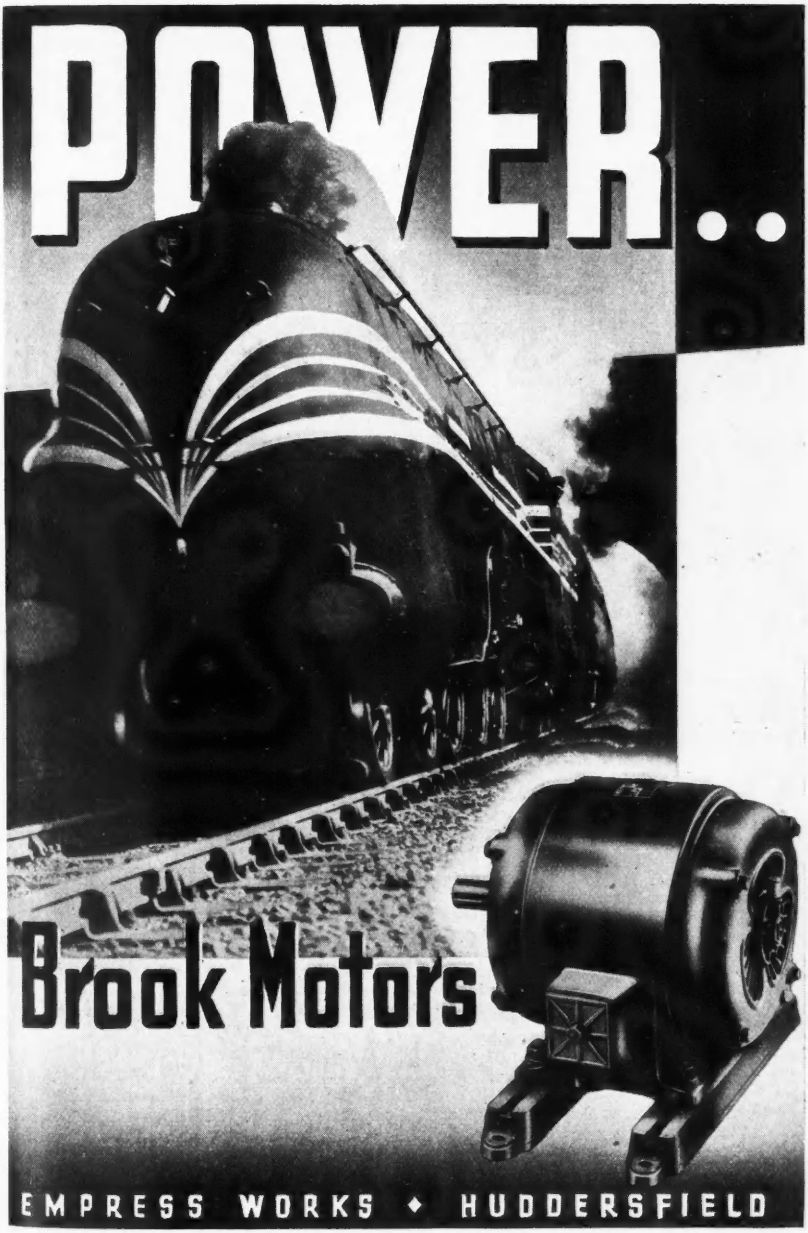
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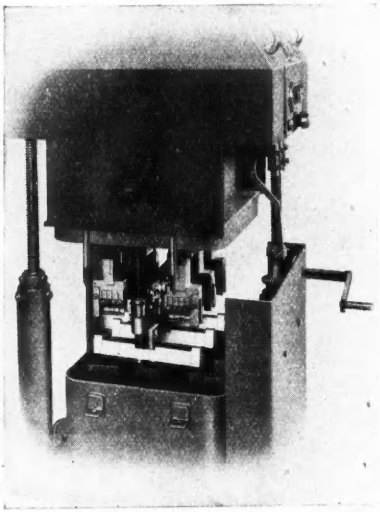

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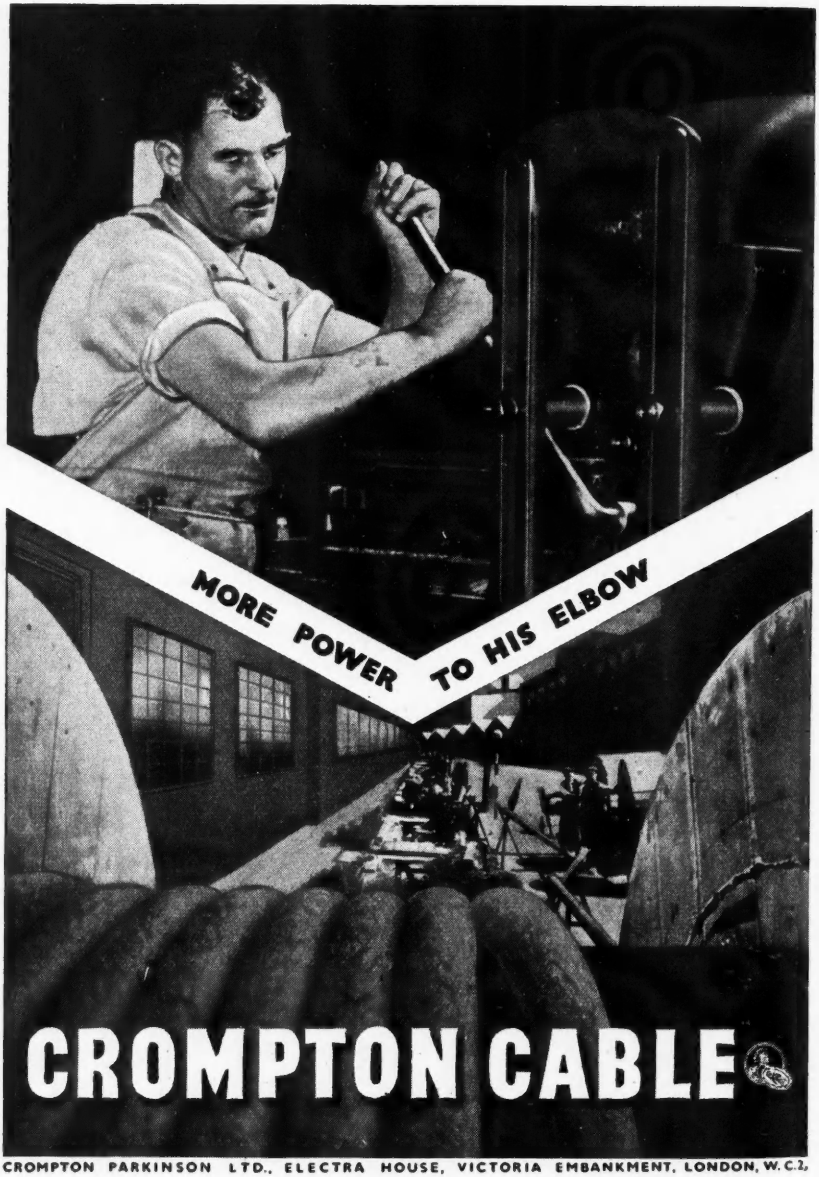

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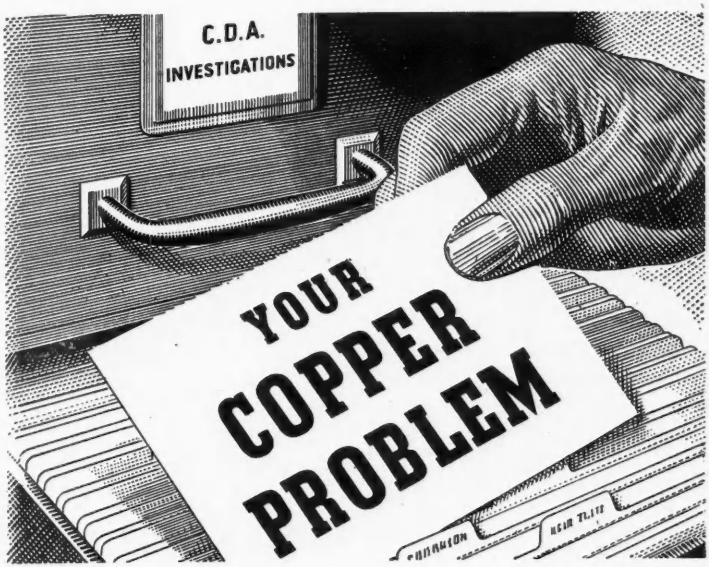

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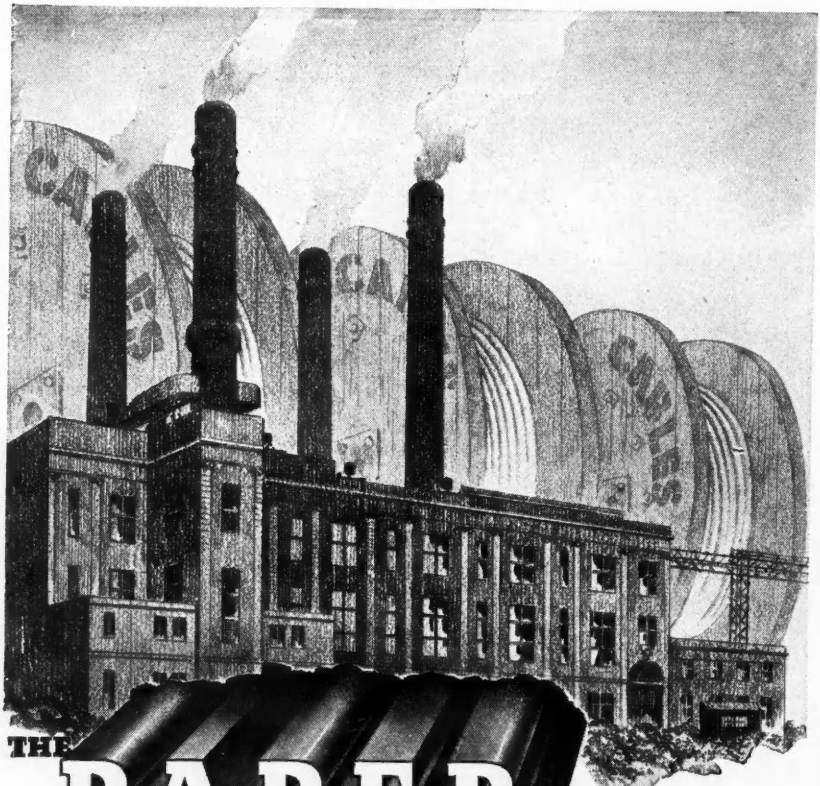

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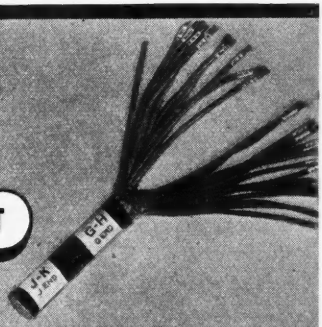

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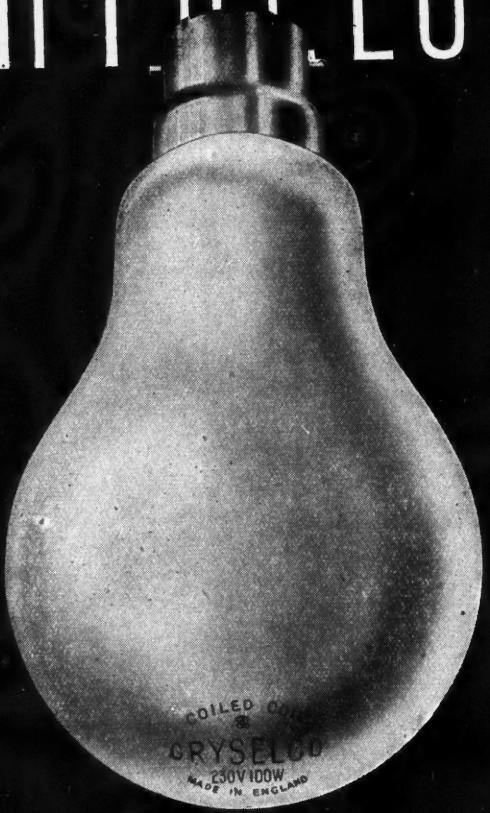

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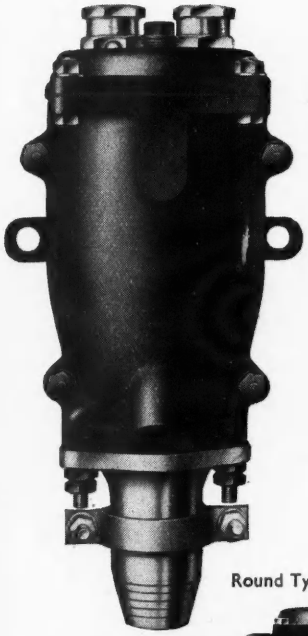

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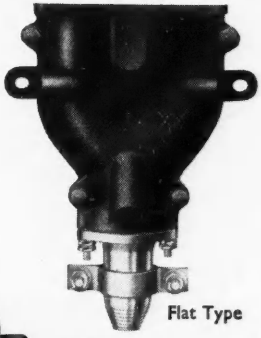

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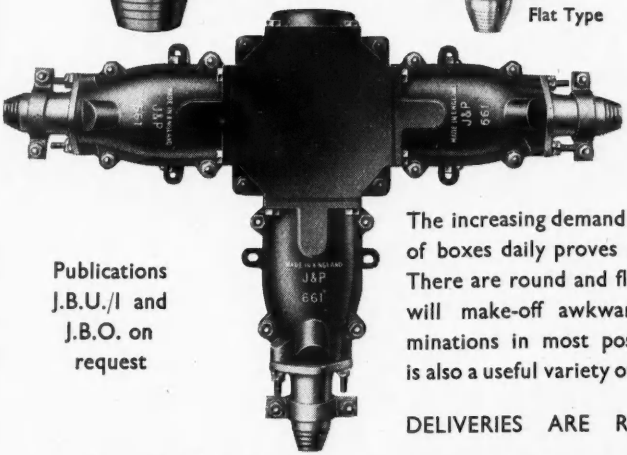

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ELECTRICAL REVIEW

Volume CXXXI — No. 3378

Friday, August 21, 1942

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXXI. No. 3378. AUGUST 21, 1942 6d. WEEKLY

Control of Peaks

Reliance on Diversity Insufficient

PREDOMINANT among the characteristics of electricity supply is the consideration that current is produced as it is used. There is, therefore, no inherent "fly-wheel effect" to tide over variations in demand. This peculiarity time has intensified, because such alleviation as was once found through paralleling accumulators with generating plant or, more indirectly, through the large water spaces of the boilers then in use, is no longer available. Another adverse circumstance is that the peaks responsible for the standing charges on the plant are no longer chiefly occasioned by lighting, which will bear a relatively high price per kWh, but by other services which require lower rates to be economical.

Mains Costs Predominate

Transmission and distribution absorb a continually growing proportion of the total expenditure on electricity supply. This tendency enhances the value of high load factor, since mains costs are more closely related to load factor than are the costs incurred in the generating station, where coal furnishes a substantial running component, to that extent depreciating the advantages of a high output-demand ratio.

A good system load factor generally owes most to the natural diversity of demand between various applications of electricity. There are, however, many loads that show little diversity either within their group or with other groups, *e.g.*, heating during "cold snaps." If the shape of the load curve is to be improved, something more than reliance on diversity will be necessary. A promising line would appear to be the regulation of the incidence of individual demands.

Domestic water storage offers an obvious field for peak control and is of course well established by now, but space heating, due to the potential magnitude of its demand and its poor diversity, would provide considerably greater scope. Much has been done in this way by means of electrode and resistance water heaters, low-rated tubular heaters and the technically better system of storing electric heat locally in a medium, such as soapstone which has been used for this purpose with some success on the Continent.

Before the war beginnings had been made with centralised control of certain loads by the injection of high-frequency currents into the mains to operate relays on consumers' premises. About a dozen systems of this kind are available, all with distinctive features. It seems possible that, as soon as conditions permit, their vogue will increase.

Standardisation of Equipment

Two questions must be considered. The first is whether, without cramping development, some measure of standardisation of essential parts, more particularly relays, should not be taken in hand, with a view to avoiding heavy expenditure later of the kind incurred in national frequency standardisation.

The second question relates to the point at which control should take place. Under

independent operation it is advantageous to make this the generating station, but under grid operation the stations have to be regarded for the present purpose as one generating unit. It might in time be found desirable to add peak control to the duties of the Central Electricity Board, at the same time lightening its burden of coping with rapidly rising loads each day. Before much on the lines indicated can be done, it will be necessary to investigate what loads lend themselves to peak control without inconveniencing consumers. The aim should be to make peak control an adjunct of diversity in keeping the distributors loaded at as nearly a constant value as possible and saving capacity of generating and transforming plant.

First Fuel Summonses

THE first cases under the Waste of Fuel Order, 1942, were heard at Bow Street Police Court last week and are reported in this issue; two of the defendant companies were fined and the summons against the third was dismissed after it had been shown that an "enforcement officer" had had no training for his work. It is stated that the Ministry of Fuel now intends to employ qualified men for the purpose. The fining of a Birmingham householder is also reported. It is hoped that these examples will serve to impress upon all users of fuel that waste is an offence. No doubt it was with this intention that so much publicity was given to the issue of the summonses, a matter that was objected to by the defendants and deprecated by the magistrate. With due deference to the Court, we consider that it was not wrong to inform the public of the proceedings, but there was perhaps no necessity to mention names.

Tapping all Sources

BEST results are obtained with back-pressure turbo-generators when the demand for low-pressure steam for industrial processes is very large compared with the electricity demand. This is not often the case, however, and these demands are rarely simultaneous. Sometimes there is electricity to spare that cannot, for commercial reasons, be fed back to the public mains, from which a supply is normally drawn to supplement the output of the generator. Such considerations do not now apply and the need to use every kWh in the interests of coal economy is paramount. We have no doubt that engineers of undertakings will see the reasonableness of the request of the Electricity Commissioners that any conditions that may preclude the most economic use of private generating plants should be relaxed, and that surplus electricity so produced should be absorbed into their networks.

Power Engineers' Salaries

IN our issue of August 7th we referred to the dissatisfaction of the members of the Electrical Power Engineers' Association with the system of discounting the effects of taxation in calculating the cost-of-living adjustment of salaries. The National Joint Board of Employers and Members of Staff has now decided to revert to the former arrangements and there is to be a special adjustment of salaries on October 1st. It is regrettable that the good example of the E.P.E.A. was not generally followed, and in the circumstances the feelings of the members can be understood.

Care of Appliances

THE scarcity of new electrical appliances compels the utmost care and attention to those already in use. In the United States it is estimated that there are over 216 million appliances in the homes of the people and stocks of repair parts are said by Mr. B. W. Clark, of the Westinghouse Co., in *Electrical Merchandising*, to be sufficient for two years. The company has prepared "Care and Use" booklets to guide consumers into the right ways, and about two million of these have been distributed through dealers and utility companies. Sales and service men are devoting their energies to keeping appliances in operation, training dealers in service methods and maintaining friendly relations with the trade.

Strange Bedfellows

THERE are so many Departmental Orders already that it may seem queer to ask for more. But there is one thing that has irritated us for some time—the Limitation of Supplies (Heating Apparatus & Polishes) Order, 1942. Goodness knows why these very dissimilar goods were thus bracketed; they do not even possess the alliterative affinity of shoes and ships and sealing wax. The first opportunity of separating them should be taken.

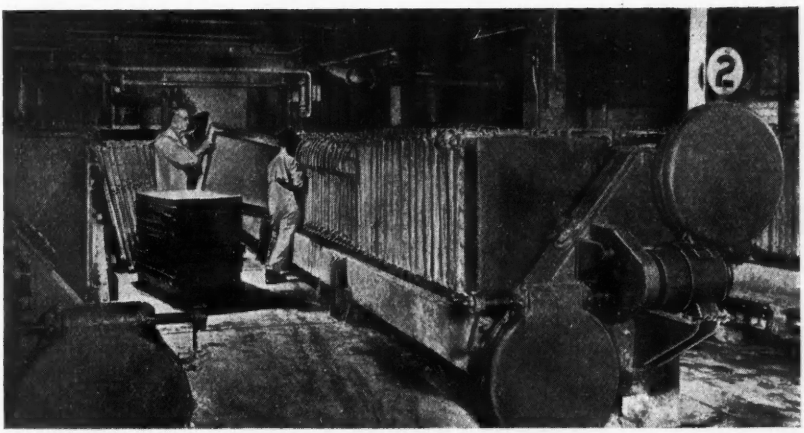
Soap Making

How Electrical Methods Assist Production

Rationing has caused us to look with increased interest and respect on soap. Probably few of us know more about this most useful commodity than that fat of some sort or another is required for making it, and it will, therefore, be instructive to trace briefly the whole process of manufacture, in particular seeing what a large part is played by electricity in present-day methods.

BROADLY speaking three main processes enter into in modern commercial soap manufacture, *viz.*, the cold process, mainly for cheap toilet soaps; the semi-boiled process, for soft and low percentage fatty acid soaps; and the boiling process. In normal times about 90 per cent. of the soap produced is made by the last-mentioned process, but to-day practically all soap is made in this manner, and we shall therefore confine ourselves to a description of this process, as carried out at two up-to-date factories we visited recently belonging to T. H. Harris & Sons, Ltd., a subsidiary of Lever Bros., & Unilever Ltd.

Tallow (beef or mutton), fats, palm and nut oils are mostly used. Generally they arrive in large tank wagons, whence they are transferred to storage tanks by means of pumps operated by 8½-HP, 420-RPM Crompton Parkinson motors. Sometimes, however, the fats are delivered in casks, in which case they have to be melted out by steam before being pumped into 100-ton storage tanks.



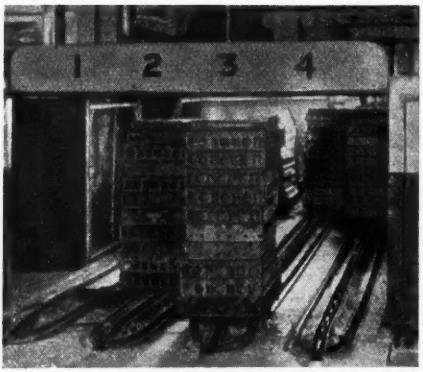
A water-jacketed quick cooler

The first stage of manufacture is the bleaching and refining of the fats and oils. This is undertaken in large vacuum pans holding about 5 tons each. After being pumped in by means of electric pumps (4-HP, 950-RPM motors) the fats are treated with fuller's earth and steam-heated under a vacuum for about two hours. The mass is stirred all the time by agitators operated by 6-HP geared motor units (Crofts, Ltd.) running at 60 RPM. The vacuum pumps (W. H. Bailey & Co.) are driven by 6-HP, 920-RPM motors (Crompton Parkinson and Aston). When the bleaching is complete the mass is cooled and transferred by a Worthington-Simpson pump to filter presses which remove the fuller's earth. From the receiving tank the refined oil is pumped into 50-ton storage tanks ready for transferring to the boiling department.

For this process large pans holding up to 100 tons each are used, fitted with open steam coils and supplied with steam at 60-80 lb. per sq. in. pressure, which provides a means of mixing the mass during the process. "Saponification" is the first stage. This consists in pumping in the fat or oil, with steam turned on, at the same time gradually adding caustic soda at such a rate that the mass always has a slight excess of caustic. During this process brine is added to prevent too rapid saponification, but not in sufficient quantity to "grain" the soap, that is, throw it out of solution. When all the charge is in, the mass is boiled

for an hour to eliminate any free caustic alkali and it is then ready for graining.

With the mass still boiling, salt or brine is added (to about 10 to 25 per cent. of the total mass according to the type of fat or oil used) until the curd soap separates from the salt solution. The steam is then shut off and the mass allowed to stand overnight, during which time it settles into two layers, the curd soap at the top and the salt solution of "spent lye" as it is called, at the bottom. The spent lyes are then run off and taken by means of Pulsometer pumps (3-HP, 920-RPM Fuller motors with E.A.C. starters) for the production of the important by-product, glycerine, which is present to the extent of 4 to 8 per cent.



The bar soap drying tunnel

When the spent lyes have been drawn off the steam is turned on again and a slight excess of caustic soda and water are added until the contents of the pan are in a "closed" condition, and boiling continues for three or four hours to ensure thorough saponification. Brine is then added to procure graining again, the steam is turned off and the pan is allowed to stand overnight.

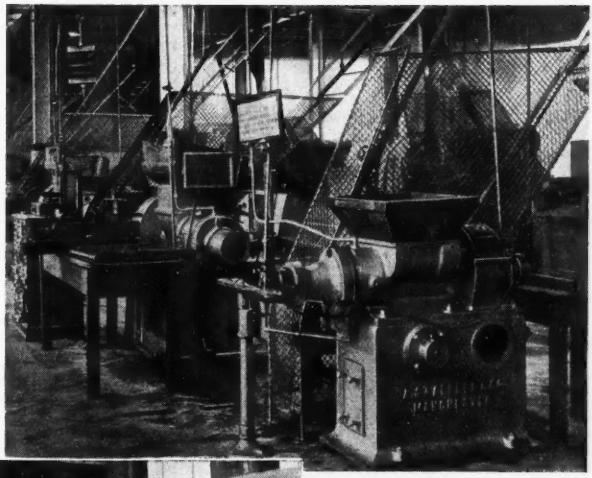
The contents again separate out into two layers, curd soap on top and half spent lyes below. The latter, containing glycerol and a small percentage of caustic soda, are run off and utilised for second grade soaps. Steam is once more turned on in the pan, water is added until the mass assumes a semi-closed condition and the boiling is continued until the mass is homogenous. After standing for from two to seven days, the mass again separates into two layers, the top being "genuine" or "pure" soap (containing about 70 per cent. anyhdrous soap and 30 per cent. water) and of the bottom approximately 20 per cent. of the whole is "nigre," which, as its name implies, is black and contains a proportion of soap and impurities: the latter is used up in inferior brands.

From the pans the soap is run off into frames or is pumped under a pressure of 30 lb. per sq. ft. by means of a Mather & Platt air compressor (3-HP motor) into water-jacketed coolers. The cooling and hardening process takes a minimum of three days in the frames, but by using the coolers the soap is ready for handling in a matter of about 2½ hours. A slab of soap made in the cooler measures 44 in. by 24 in. by 2¼ in. and weighs 84 lb. The blocks made in the frames are 45 in. long by 15, 16 or 18 in. wide and of any depth, and weigh from 11 to 15 cwt. The latter are cut up horizontally into slabs by means of an automatic machine for which a 3-HP Fuller motor running at 940 RPM is employed. Five tons of soap an hour can be dealt with in the machine (3-HP 940-RPM motor) used first for cutting the

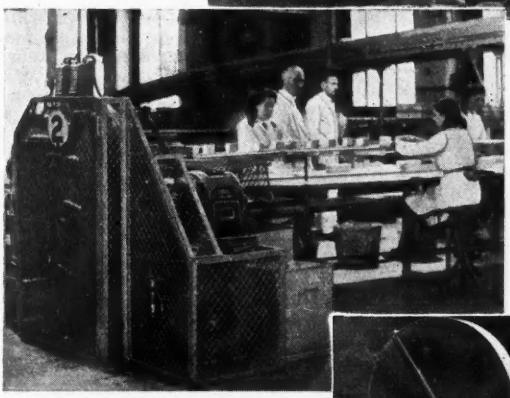
The cutting table

slabs up into long bars and then dividing them into the standard 4-oz. tablets. (We are, of course, referring at present to the household or laundry soaps. Toilet varieties are produced in a somewhat different fashion to which we will refer later).

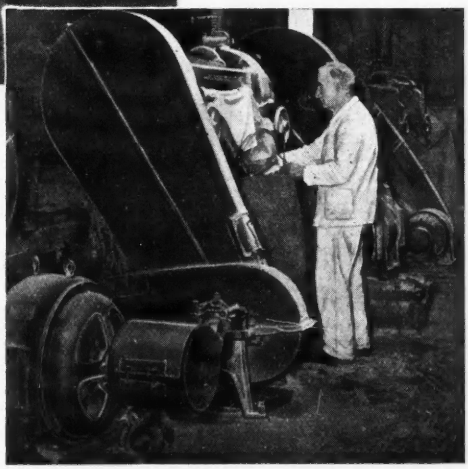
In order to give the tablets of soap a surface suitable for stamping, they are passed slowly through a drying tunnel on a chain conveyor (6-HP, 940-RPM Fuller motor), two large



Plodding machines for making toilet soap. The mills are seen in the background



A hundred and sixty tablets a minute are stamped on this automatic machine, and (right) a machine for producing soap flakes



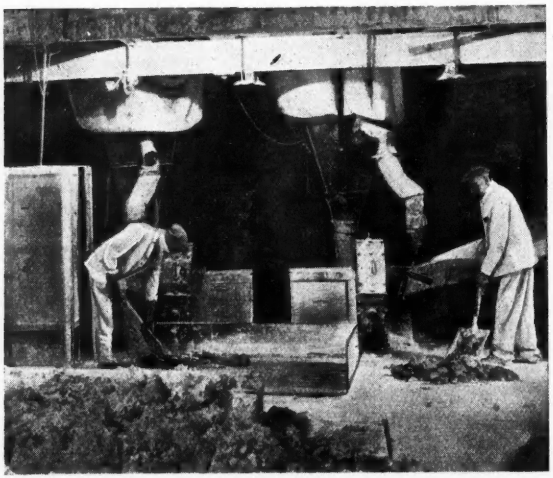
fans (12-HP, 960-RPM motors) providing the necessary current of air. A hundred and sixty tablets are stamped every minute on each of the automatic stamping machines (R. A. Jones & Co.) driven by 3-HP, 940-RPM Fuller motors. Hand stamping is employed for the long bars used by laundries, etc. Operating the conveyors running down the packing tables are ¾, 1 or 1½-HP, 1,400-RPM Crompton Parkinson or Fuller motors with reduction gearing. The same types of motor are employed for conveyors on which

the wooden boxes containing the tablets are nailed and bound with wire. The boxes used are made in a special department, the equipment of which includes an electrically-operated saw bench (6-HP, 1,000-RPM E.C.C. motor) and nailing machines (8-HP, 720-RPM

Holmes motors). For the warehouse conveyor a 3-HP, 940-RPM Fuller motor is utilised.

Toilet Soaps

Toilet soaps are produced from a specially prepared base. The "genuine" soap previously referred to is run direct from the pans at about 185 deg. F. over large rollers (which are internally water cooled), the solidified soap then being flaked by knives serrated with edges on to an apron which conveys it slowly through a drying chamber. By this method as much of the 25 per cent. moisture content of the pure soap as required can be removed and a moisture content of as low as 2 or 3 per cent. can be achieved. The time taken for flake-making varies with the type of soap, but generally the cycle occupies about half an hour.



The soap powder section showing the disintegrators

For driving the rollers 19-HP, 940-RPM Fuller motors are used, while for the pump circulating the hot water through the rollers there is a 4-HP, 1,430-RPM Crompton Parkinson unit. Leaving the machine the flakes are bagged and taken away by conveyor (2-HP, 975-RPM Crompton Parkinson motor) for further processing.

For making toilet soap these flakes are placed in bins and various other ingredients, such as perfume, colouring matter, medicaments, etc., added. This mixture is then passed through sills fitted with steel or granite rollers which are of different sizes so that the action is both rubbing and crushing. "Plodding" is the next process, the mixture passing through machines very similar to sausage machines and coming out in an endless bar, which is then cut, stamped and wrapped on conveyor belts in much the same way as in the case of the household soap. Four mills and four plodders are belt driven by a single 9-HP, E.C.C. machine running at 580 RPM, a further two mills and two plodders having a 50 - HP, 780 - RPM Vickers unit to drive them.

Soap flakes, as known by the housewife, are much thinner than those used for the manufacture of toilet soap, and are made in special mills with motors ranging from 20 to 35-HP and running at speeds of from 720 to 960 RPM.

A fully automatic machine is used for weighing and filling these flakes into cartons; this is operated by a 5-HP, 720-RPM Holmes motor. The cartons after being glued are placed in sealing machines (¾- or 1-HP, 1,400 - R P M motors). which hold the tops of the cartons secure until the glue has had sufficient time to dry.

We should like to thank Mr. A. J. Harvey, director of the works and Mr. W. A. Bryett, the company's chief chemist, for their assistance in the preparation of this article.

Indian Telephone Manufacture

FOR some time the Indian Posts and Telegraphs Department has been endeavouring to confine purchases to indigenous stores and to manufacture as much as possible of its own requirements, states *Indian Engineering*. In the Department's report for 1940–41 the total value of stores purchased in India during that year is shown to be Rs. 77.86 lakhs as compared with Rs. 34.78 lakhs in the previous year. The value of stores purchased from abroad during the year amounted to only Rs. 2.70 lakhs.

Telephones which used to be imported are now being manufactured in the Government telegraph workshops. Bakelite presses have been ordered for the manufacture of bakelite bodies for telephones instead of the cast aluminium bodies used at present. Telegraph carrier equipment made in the workshops has given satisfactory service and the manufacture of some more equipment of this kind is now in hand. This is the first major development of communication equipment of the modern type designed and constructed in India. The design of equipment from materials available in India, to give the same standard of performance as imported apparatus, involved considerable research and led to the entirely local manufacture of accurate coils, condensers and filters.

Contact Resistance

Temperature Rise in Switches

By R. W. J. Cockram,
A.M.I.E.E.
(*Rotary Switch Engineer, Santon, Ltd.*)

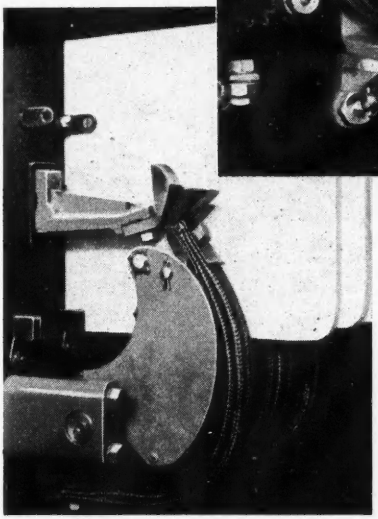
ONE of the factors which complicate the control of electric circuits is the contact resistance set up between two mating surfaces of metal which at times have to be separated in order to break continuity of supply.

Endeavours have been made to minimise contact resistance by welding and other methods of fusing silver surfaces to the copper surfaces and by means of special alloys. If contact resistance values are high, and heating due to the passage of heavy current is allowed to persist, the contacts will soon be wrecked, even although they have not been separated under load.

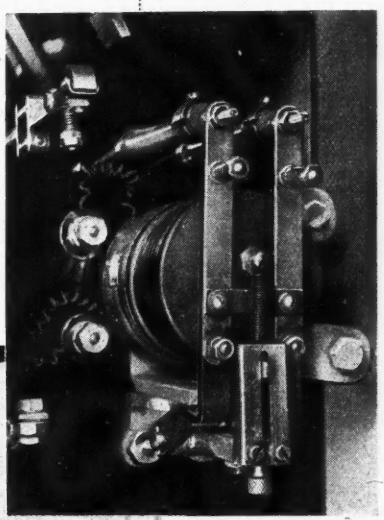
The two main methods of decreasing contact resistance, excluding the use of special contact tips, are to increase the contact surface area and to increase the contact pressure. Contact pressure can be applied only up to a given point, beyond which it results in a welding in of contacts so that the operating mechanism will not separate these when the circuit is broken. As large contact surfaces are uneconomical, they are made as small as possible consistent with a contact pressure low enough to preclude welding in.

Knife-type contacts depend mainly on large contact-surface area, rather than pressure between mating surfaces, to maintain low contact-resistance values. They should not be worked at more than 500 A per sq. in. of contact surface area and often in the case of large knife switches a clamping bar is provided in order to increase contact pressure. These switches, unless enclosed, are operated only as isolator switches, *i.e.* under no-load conditions, but this type of contact can, by suitable design, be used for "on-load" working and provides the basic form of the contacts used in rotary switches.

Point butt-type contacts mainly find application on instrument-control switches, control-circuit contacts or interlocks on contactor gear. They are rarely rated above 5 A at 440 V and the pressure between the mating points is usually very light. The contacts take the form of portions of spheres, two breaks in series being employed as in the case of knife-switch contacts. The contacts are usually of silver and are soldered to the main bars for economy and mechanical strength. A slight "wiping" action takes place on making and breaking circuit which assists in removing any oxide formed.

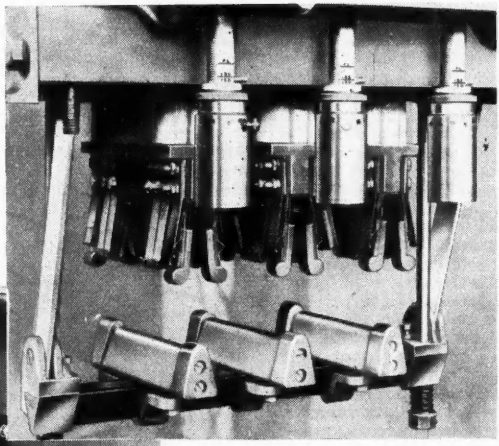


Pressure-type line contacts for main poles of contactors up to 150-A (Brookhirst Switchgear, Ltd.)

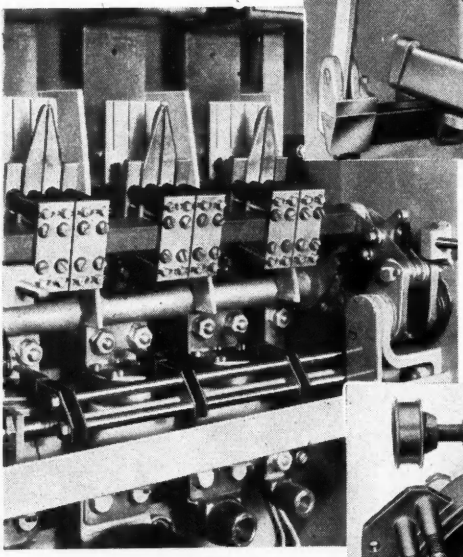


Pressure-point butt-type contacts for interlocks on contactor gear (Brookhirst Switchgear, Ltd.)

Line butt-type contacts are also chiefly associated with contactor-type apparatus when comparatively heavy contact pressures are applied, generally to the main poles of contactors up to 150 A with spring pressures ranging up to 8 to 10 lb. per sq. in. Replaceable contact tips are used. Relative motion takes place between the pole faces upon closing and opening which gives a degree of " wipe " action.

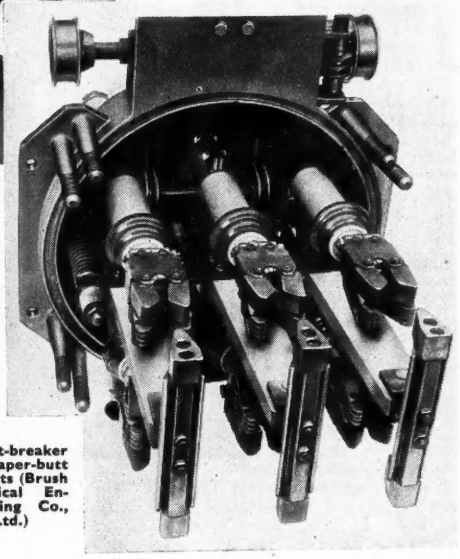


Taper-butt contacts of simple and accessible design (Johnson & Phillips)



Surface-contact type of 400-A air breaker with contacts open ; eight compression springs per pole and large contact-surface area (Johnson & Phillips, Ltd.)

With surface-type contacts complete mating of contact surfaces is essential. For this reason each moving contact is divided into four segments and each has two springs acting upon it. The " bedding " of contacts calls for skill on the part of the erector, who usually works in the first place to a $1\frac{1}{2}$ thousandths of an inch feeler gauge and finishes with double-coated carbon paper which is placed between the contacts while they are being closed, the aim being to obtain impressions from the carbon paper over the complete surface of each contact face. This is a similar method to that used for reducing the 50-cycle " hum " of contactor gear, only in this case it is the mating surfaces of the laminated armature which are " bedded," while an air gap of



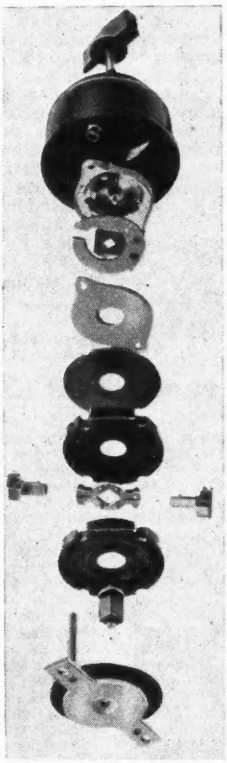
Circuit-breaker with taper-butt contacts (Brush Electrical Engineering Co., Ltd.)

approximately 10 to 15 thousandths of an inch is ensured where the other end of the armature matches with the laminated core of the operating coil.

Comparatively long arcing horns which are incorporated in the contacts prevent burning of the surfaces, since the arc is forced to travel up the contact on to the arcing horn section by the rising air currents set up by the heat dissipated by the arc. Magnetic methods of extending the arc are also employed to assist in pulling the arc away from the bedded surfaces.

Taper-butt surface contacts are employed for the control of heavy currents, as in the case of circuit-breakers and similar equipments. The tapered design is the most suitable form of contact to ensure complete bedding, the break taking place between steel-alloy arcing contacts which open after the main contacts. Outstanding features of some modern designs are the use of helical springs for control of the arcing contacts, a steel backing plate to prevent excessive side movement of the arcing contacts and the incorporation of pins working in slots in the main contacts to prevent excessive movement and hence overstress of the backing springs.

In contacts of this form, a heavy form of push-off spring must be incorporated in order to obtain "DC-break" conditions, *i.e.*, the contacts are opened at high speed and the arc formed is broken down by increasing the resistance of its path and cooling, in contradistinction to a slow-break method where the zero values of the AC wave are employed to prevent the arc restriking.



Exploded view of large rotary switch designed to give single-pole "on-off" control (Santon, Ltd.)

In all forms of contacts discussed here, pressure is applied to the mating surfaces, as otherwise only the high spots will be in contact with one another. Beyond the absolute limit of the malleable properties of the metal very little reduction in contact resistance is obtained. In fact long before this point is reached, the surfaces will weld together. Some small degree of spot welding may be allowed while the wiping action is sufficient to break it, but it is preferable to prevent this if at all possible. With knife-switch contacts, the comparatively light pressure exerted between surfaces is generally provided by the inherent flexibility of the contact. Large surface area ensures good contact and unless the currents are heavy this method is quite suitable.

It was, at one time, considered that burning and pitting or destruction of contacts took place mainly on rupturing a circuit. It is now known that in many cases more damage is caused to the contact surfaces by burning due to imperfect mating during long periods in the engaged position than during the short periods of actual breaking. The contact metal is thereby oxidised and since oxide of copper, the metal generally used, is a bad conductor, further heating occurs, with the resultant formation of more and more oxide until the melting point of the metal is reached and surface pitting results. Silver-tipped contacts are now usually employed and these give a greater working life since oxide of silver is a comparatively good conductor.

Contacts of rotary switches are totally enclosed; hence their condition is not readily ascertainable. A method of testing each switch before dispatch was required which would not unduly retard production. An early method was based on contact pressure, which ensured that when in contact with a standard terminal the contacts would, by virtue of the friction existing between the mating surfaces, support a stipulated weight. This test certainly secured a given degree of contact pressure at each terminal, but the varying frictional characteristics of differing batches of metal used in the blades affected results so that the only guarantee was that, if the terminal blades were of uniform thickness, then contact pressure of some magnitude would be present. Under war conditions, however, variations occurred in the extrusions used and, although these were not sufficient to justify rejection on operational grounds, the difference was sufficient to affect the contact resistance obtained. This entailed remodelling the procedure, since the contact was not tested after assembly with the blade with which it would be working during its operational life.

Eventually a test was evolved whereby each contact of the completed switch was tested against a specially graduated meter which gave a deflection proportional to the resistance of the circuit, the limits of deflection being prescribed.

Self-aligning rotating contact bridges are provided with bent up corners for ease of entry for the terminals which have chamfered edges for the same purpose. Phosphor bronze of a special specification is used for the contact bridges while the terminals with which they engage are cut from extruded brass section. The complete unit, which gives a double break, is totally enclosed in the disc chamber and has a long life under full-load working.

Loose connections are more detrimental to rotary switches than to ordinary switches, since sufficient heat may be set up in the terminal block to char the bakelite housing the terminal so that on the next operation a complete section of the housing is forced out and hence the switch is " burnt out." Apart from this it will be found in practice that the maximum temperature rise at full rated current is under the maximum laid down by relevant British Standard Specifications.

Back-of-panel mounted switches of 60-A rating and above are fitted with cable soldering thimbles of special design. These may also be fitted to front-of-panel mounted switches, but the space they occupy makes a special cover necessary. These thimbles are bolted to the terminal block and ensure good contact conditions.

Acknowledgments are due to Johnson & Phillips, Ltd., the Brush Electrical Engineering Co., Ltd., and Brookhirst Switchgear, Ltd., for the loan of photographs reproduced.

American Power Expansion

Next Year's Requirements put at 300,000 Million kWh

GLIMPSES of the targets that electricity producers in the United States are being directed to aim at are afforded by sayings and doings reported in the American technical journals. For instance, the chairman of the Federal Power Commission has recently predicted that 300,000 million kWh will be needed next year for war production and essential civilian purposes. Of that amount, he says, public suppliers will have to generate not less than 255,000 millions, which will be an increase of 75 per cent. over the 145,000 millions they generated in 1940.

Since past achievements are not good enough precedents for requirements created by present circumstances, estimates of the above kind must be based on an assumption; in this case it is that " an effort will be made to attain to a war programme measured by an annual rate of $70,000 million a year." This is stated to mean that 18 million workers in industry will be expected to utilise about 12,000 kWh each annually. Minimum non-industrial requirements are placed at 70,000 million kWh.

That widespread power pooling and rationing will be necessary seems certain; indeed the Allocation Section of the Power Branch of the War Production Board has already set about estimating " curtailable loads " in each of the forty-eight power areas of the nation in order to afford basic data for administering the Limitation Order L–94 (Power Curtailment) and for determining what additional equipment must be furnished in 1943 and succeeding years.

Plant Construction

The American electricity supply industry budgeted to spend $1,069 million on new construction this year, or 23 per cent. more than last year's outlay. A recent Federal Power Commission report reveals that the gross additional generating capacity scheduled for this year was 3,735,035 kW, which is 1,288,725 kW more than the net instalment of 1941. The capital to be expended was intended to be almost equally divided between enlargement of generating capacity and improvement of transmission and distribution facilities, whereas decreased additions this year to both distribution and general plant are recorded.

Of the total budgeted for this year, private utility companies anticipated spending $621,945,204; this was $30,026,656 more than they spent last year. Publicly-owned utility concerns intended to provide $447,364,183, or $20,695,877 more.

Manufacturers' Orders

Spurting sharply after a slump in February, orders for motors and generators " hit a new high " in March of this year. According to the National Electrical Manufacturers' Association there was an increase of 167 per cent. in twelve months, while orders for transmission and distribution equipment advanced by 34 per cent.

The value of orders for electrical goods booked by 78 manufacturers during the first quarter of this year established a record for any three-monthly period. Statistics released by the Bureau of Census of the U.S. Department of Commerce show the amount to have been $759 million, an increase of $205 million.

The average daily production of hydro-electric energy within the United States last April was a record at 198,568,000 kWh, the output for that month reaching 5,580 million kWh, or 38.9 per cent. of the total output for public consumption during that month, which amounted to 14,334 million kWh, being an increase of 13.1 per cent. in a year.

The Federal Power Commission reports that in the twelve months ended April 30th this year the total production for public use was 172,116 million kWh, a 16.2 per cent. increase in one year. The aggregate capacity of hydro-electric generating plant in service in the United States at that date was 45,045,691 kW, the year's increase being 317,283 kW.

During April water power stations in Canada exported 216 million kWh to the United States.

Ice on Conductors

Suggested Amendments of Overhead Line Regulations

By J. McCombe,
Ph.D., A.R.T.C., A.M.I.E.E.

THE starting point in the design of an overhead line is the conductor loading, since its vertical, horizontal and resultant weight will determine the lateral pull on the structures, while the tension likewise enables the structures at terminal and angle positions to be designed to withstand the specified loads.

The Electricity Commissioners' Overhead Line Regulations, El.C. 53 (Revised), call for a factor of safety of line conductors of 2, based on the breaking load, and calculated at a conductor temperature of 22 deg. F., when the radial thickness of ice covering is $\frac{3}{8}$ in. for AC voltages of 325 and over and $\frac{1}{16}$ in. for lower voltages. It is assumed that the conductors are simultaneously subjected to a wind of 50 miles per hour at right angles to the line, exerting a pressure of 8 lb. per sq. ft. calculated on the whole of the projected area of the ice-covered line. The weight of ice is taken at 57 lb. per cu. ft. and the elasticity of the metal may be allowed for in calculating the sag.

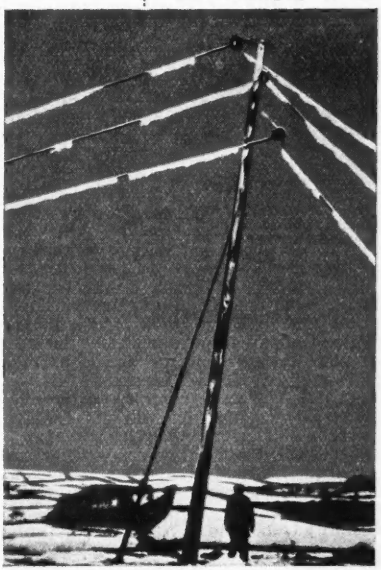
From time to time overhead lines fail by mechanical overstress alone due to the presence of excessive ice deposits. These deposits have been widespread and suggest a new cycle of conditions. In view of the severity of recent winters I feel that an amendment of the Regulations is overdue.

Basic Loadings

In the first place, the selection of a different basic loading for higher than for lower voltage lines is very much open to criticism. I have never been able to equate the two sets of loading, since wind and ice loading is a function principally of exposure and altitude, and definitely not of line voltage or conductor size.

An attempt made in German regulations to make ice loading a function of conductor size was not successful. In support of our present regulations the argument is often put forward that higher-voltage lines should have a higher standard of construction than lower-voltage lines, but surely dissimilar ice loading is not the criterion. The deposits on overhead lines in exposed places are more or less constant irrespective of the voltage. If a better standard of construction is desired, then the more logical method would be to adopt a higher factor of safety of erection. Furthermore, lower-voltage lines with the same coating of ice will always have a greater security than those for higher voltages owing to the shorter span lengths which are customary.

If a higher standard of construction is required for high-voltage lines, three factors have an important bearing. These are span length, type of conductor used and factor of safety of conductor erected. In regard to the first the stability of an overhead line under loaded conditions greatly increases as the span length decreases. For example, it requires 10.65 lb. of ice per ft. run to cause failure through overstress of an 0.15 sq. in. equivalent (37/.102) steel-cored aluminium conductor erected on a 300 ft. span to a factor of safety of 2 at worst load conditions of $\frac{3}{8}$ in. radial ice at 22 deg. F. If, however, the span length is increased to 600 ft. but the erection conditions remain the same, the equivalent figure is only 5.43 lb. per ft. run.



Overhead line with 0.3 sq. in. equivalent steel-cored aluminium conductors which failed owing to excessive icing in high wind

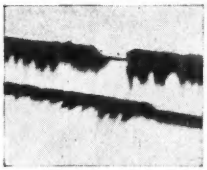
If stranded copper conductor of 0.15 sq. in. were erected to the same conditions, then 3.176 lb. of ice would cause failure. Thus by using a composite conductor of the equivalent size to copper a 71 per cent.

increased ice loading is required to cause its failure, a substantial increase in the stability of any overhead line.

One of the most important considerations is the factor of safety of erection. An 0.1 sq. in. equivalent (7/.147) steel-cored copper conductor erected on a 400 ft. span to a factor of safety of 2 will fail with an ice loading of 4.79 lb. per ft. as compared with 5.97 lb. under the same basic loading conditions but at a factor of safety of 3.

Ice Formation

In the Overhead Line Regulations assumptions have been made in order to simplify the problem of ice loading. The ice is taken as forming a true annulus around the conductor for the whole of its length and as exposing a uniform front normal to the wind. My observations of ice deposits on overhead lines over a period of years, however, have convinced me that ice is never deposited evenly or uniformly on conductors either in wind or calm.



Icing resulting from foggy conditions which caused breakage of the 0.15 sq. in. equivalent s.c.a. conductors

The nature of the deposit depends to a great extent on the wind and the atmosphere prevailing at the time of icing. If a wind is present the ice tends to form to a greater thickness on the leeward side of the conductor. This can be closely inspected on wire stays. This effect is contrary to the often expressed view that ice will not form on overhead conductors in a gale, and that in a high wind it will not be deposited beyond two diameters and in a normal wind to more than three diameters. If this were true in practice an amendment of the Regulations would not be required.

Early in 1937 I experienced ice deposits which caused steel-cored aluminium conductors to fail in the presence of a very high wind. Windage in my opinion helps to build up ice deposits on the conductors, as each particle of sleet contains kinetic energy due to the wind and this assists in the cohesion and agglomeration of the particles and is responsible for the heavier deposits being driven to the leeward side of the conductor. I believe it also accounts for the different densities of ice coating found on overhead lines.

The worst deposits of ice, however, are not a result of sleet and wind but of fog, particularly at high altitudes. I have experienced the same type of deposit near sea level and near the coast but never inland. One such case resulted in the failure of steel-cored aluminium conductors on a steel tower line, which had an ice deposit of over 4 lb. per ft. length. At high altitudes, however, fog deposits are common. The theory is that the fog is present at a low temperature and as soon as it finds a metal anchorage it precipitates the ice. Conductors, telephone wires, stay wires and fence wires are ideal anchorages, but even wood poles get heavily coated with ice. The heaviest and most rapid deposits result from fog in the presence of a light wind, when the icing is worst on the windward side of the conductor, due probably to the anchorage being encountered first on that side. Icing as a result of fog has usually a solid core but becomes fuzzy and less dense on the surface. It is the persistent fogs which have resulted in the rapid and heavy deposits of ice which caused such havoc in recent years.

Wind Pressure on Conductors

The effects of wind are far from determinate and it is assumed that the wind exerts a uniform pressure over the whole projected area and length of the conductor. In the Regulations the basic windage is given as a gale of 50 miles per hour exerting a pressure of 8 lb. per sq. ft. of projected area, whereas a true velocity of 50 MPH exerts a pressure in excess of 8 lb. per sq. ft. It can only be assumed that this figure is intended to represent a recorded velocity.

One of the common methods of measuring wind velocity is by the anemometer, which is a frictional instrument and accurate over only a very narrow range. At low velocities an

Pole-line route at an altitude of more than 1,000 ft. where snowfalls in addition to heavy sleet and fog are common in winter

addition must be made to the recorded velocity to give the true velocity, due to frictional losses, while at high velocities a big reduction is necessary. An anemometer reading of 80 miles per hour represents a true velocity of 61.5 MPH, while a recorded velocity of 50 MPH represents a true velocity of 40.5 MPH. If the 50 miles per hour were a true velocity the pressure it would exert exceeds 8 lb. per sq. ft. Wind pressures in the British Isles are calculated from the formula based on the N.P.L. and Eiffel Tower experiments, as follows:—Wind pressure per sq. ft. of plane surface = $.0032V^2$, where V = recorded velocity of wind in miles per hour = $.0032 \times 50^2 = 8$ lb. per sq. ft.

From this it is apparent that a pressure of 8 lb. per sq. ft. is exerted by a windage of 40.5 miles per hour. I suggest that the windage in miles per hour should be left out of the Overhead Line Regulations and only the pressure in lb. per sq. ft. given. Windage in miles per hour is misleading unless it is stated whether it is a true or recorded velocity. Furthermore, no useful purpose is served in giving the windage if the pressure is available since this is the important factor for design purposes.

There should be a vast amount of up-to-date information on both ice loading and wind pressures which was not available when the Regulations were formulated. During the past ten years extensive wind-tunnel experiments have been carried out in connection with aero-dynamics and with high structures and suspended wires in wireless research. Also, the problem of ice deposits and loading has been studied in connection with de-icing experiments.

Sub-division of Basic Loading

The grading or zoning of a country into areas according to climatic conditions is not new either on the Continent or in America, and it is surprising that it has not been adopted in this country. In the United States zoning has been introduced under the National Electric Safety Code, in which the loading on overhead lines is divided into three grades as follows:—(A) Heavy loading—½ in. radial ice with 8 lb. per sq. ft. of wind on ice-covered wires at 0 deg. F. (B) Medium loading—two-thirds resultant of heavy loading at 15 deg. F. (C) Light loading—two-thirds of the medium loading at 30 deg. F.

The adoption of these loadings, however, is not compulsory. Incidentally, the heavy loading is recommended for a high proportion of American territory which includes climatic conditions corresponding to our own. In Canada ¾ in. radial ice as a basic loading is often adopted, while in Sweden three grades of loading, *viz.*, 1¾ in., 1½ in., and 1⅛ in. of radial ice, have been adopted for heavy transmission-line design.

Many engineers, often as a result of bitter experience, zone their own areas. Where lines are erected at high altitudes and in long spans it is reasonable to assume that special construction will be necessary to ensure operation over a long period of time without failure. Such areas are often subject to heavy snowfalls in addition to heavy sleet and fog which result in ice loading. These conditions are not uncommon in parts of Scotland and Wales, and to a lesser degree in England and Northern Ireland.

In order to "zone" or "grade" an area, a knowledge of two things is essential, *viz.*, the ice loading experienced in the various localities and the ice loading per ft. run necessary to cause failure of the conductor for the range of probable span lengths.

From these two factors a span length can be selected to withstand the conditions expected, and I have compiled Table I which shows the ice loading necessary over a range of span lengths to break the conductors generally employed in high-voltage lines. A constant value for the modulus of elasticity has been assumed for each conductor up to breaking point. The basic loading is taken in each case as ⅜ in. radial ice with a wind pressure of 8 lb. per sq. ft.

TABLE I

Conductor type	F. of S.	Span length, ft.	Weight of ice to cause failure, lb.	Radial thickness of ice to cause failure, in.
0.15 sq. in. (7/.166) stranded copper	2	300 400 600 900	5.486 4.276 3.176 2.556	1.86 1.62 1.365 1.20
0.15 sq. in. equivalent (37/.081) steel-cored copper	2	300 400 600 900	10.538 8.268 5.368 3.868	2.667 2.300 1.816 1.500
0.15 sq. in. equivalent (37/.102) steel-cored aluminium	2	300 400 600 900	10.65 7.88 5.43 3.97	2.593 2.183 1.763 1.463
0.15 sq. in. equivalent (37/.102) steel-cored aluminium	3	300 400 600 900	12.61 9.71 6.97 5.36	2.848 2.443 2.043 1.748
0.1 sq. in. (7/.136) stranded copper	2	300 400 600 900	4.02 3.19 2.48 2.11	1.601 1.406 1.221 1.111
0.1 sq. in. equivalent (7/.147) steel-cored copper	2	300 400 600 900	6.25 4.79 3.44 2.64	2.024 1.749 1.459 1.249
0.1 sq. in. equivalent (7/.147) steel-cored copper	3	300 400 600 900	7.57 5.97 4.54 3.75	2.254 1.979 1.699 1.529

A glance at Table I is sufficient to indicate

that greater stability can be obtained either by reducing the span length or increasing the factor of safety.

Two classes of basic loading could be employed in the British Isles (the area not being large enough for a third), *viz.*, for lines erected at altitudes below and above 800 ft. ordnance datum, the latter including also some coastal districts where icing is prevalent.

I suggest the following alterations to the Overhead Line Regulations:—

(*a*) Omission of windage in miles per hour, only the pressure per sq. ft. of projected area being given.

(*b*) Omission of voltage for basic loading and the basing of design data on span length, factor of safety and ice loading, irrespective of voltage.

The following suggestions also are put forward for consideration, the wind pressure being taken as 8 lb. per sq. in. and the conductor temperature at 22 deg. F. in all cases.

(A) Lines erected at altitudes less than 800 ft., O/D. (1) On span lengths up to and including 200 ft. the radial ice on the conductors shall be taken as $\frac{3}{16}$ in. (2) On span lengths over 200 ft. the radial ice shall be taken as $\frac{3}{8}$ in. In both the above cases the factor of safety shall be not less than 2 under worst load conditions.

(B) Lines erected at altitudes over 800 ft. O/D and in certain coastal areas where icing is prevalent. (1) On span lengths not exceeding 200 ft. where the factor of safety conditions of wind and ice at worst load is not less than 3, the radial ice shall be taken as $\frac{3}{16}$ in. (2) On span lengths not exceeding 200 ft. where the factor of safety under corresponding conditions is not less than 2 the radial ice on the conductors shall be taken as $\frac{3}{8}$ in. (3) On span lengths exceeding 200 ft. where the factor of safety is not less than 2, the radial ice shall be taken as $\frac{3}{4}$ in.

In regard to the new *heavy* loading, a comparison of ice loading to break 0.15 sq. in. (7/.166) stranded copper erected at a factor of safety of 2 with $\frac{3}{4}$ in. radial ice and that for $\frac{3}{8}$ in. radial ice is given in Table II. Readers' views on the above subject will be greatly appreciated.

TABLE II

Span length, ft.	Radial ice to cause failure of conductors, in.	Weight of ice per ft. run to cause conductor failure, lb.
300	2.03	6.426
400	1.85	5.406
600	1.68	4.556
900	1.60	4.166

Argentine Power Schemes

Three Irrigation and Hydro-electric Projects in Córdoba

IN the province of Córdoba, in Central Argentina, three major Government irrigation and hydro-electric power projects are in course of realisation which, according to the *Review of the River Plate*, are of far-reaching importance in the scheme of the province's economy.

The three undertakings are the La Viña reservoir and power plant in the San Javier district, near Villa Dolores; the Dique San Roque extension scheme; and the Cruz del Eje reservoir and power station in the north-west of the province. They will involve a total expenditure of considerably more than twenty million pesos. Few details are available regarding the electrical features of the schemes, but the following notes give a general indication of the constructional works being carried out.

Progress at La Viña

The La Viña reservoir, of 230,000,000 cubic metres capacity, is being constructed in a natural *quebráda* (ravine). It will be fed by the Rio de los Sauces and its waters will provide irrigation for an area of from 22,000 to 27,000 hectares besides working a hydro-electric power plant with a total output capacity of 29,000 HP. Excavation, which has now been completed, has involved the removal of 51,805,736 cubic metres of soil.

The Dique San Roque hydro-electric power and irrigation scheme is designed to ensure Córdoba City's water supply and to prevent the flooding to which the City of Córdoba has been shown in the fairly recent past to be peculiarly vulnerable. The irrigation zone to be served by the waters of the new reservoir, which will have a maximum capacity of 350,000,000 cubic metres, will cover 34,000 hectares. The site of the construction of the frontal wall is across the San Roque *quebráda*, at a point only 130 metres below the dam-head of the existing Dique San Roque which the new reservoir will thus supplement.

Transforming an Arid Zone

The Cruz del Eje scheme, which in many respects is the most important of the three, will, when it has been completed, transform the northern and virtually arid zone into one of the most fertile, productive and prosperous regions of the province. It will provide the town of Cruz del Eje with a service of running water and its waters will feed an irrigation system covering from 20,000 to 25,000 hectares of highly fertile land.

The reservoir itself will be fed by the waters of the Cruz del Eje River and its several tributaries and will have a maximum capacity of 125,000,000 cu. metres. The main constructional feature of the undertaking is the central reinforced concrete dam-head 860 metres in length and having a maximum height of 40 metres. This project is expected to be finally completed and put into service in approximately a year's time.

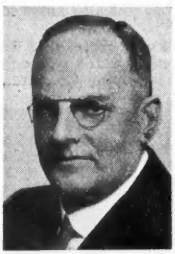
PERSONAL and SOCIAL

News of Men and Women of the Industry

WHEN the impending retirement of **Mr. W. J. Bache,** borough electrical engineer of Cheltenham (reported last week) was referred to at a recent meeting of the Town Council, the Mayor (Councillor T. W. Waite) spoke of his "conspicuous ability and great foresight". One instance of Mr. Bache's initiative, he said, was that on the last contract made with the suppliers £38,000 had been saved. The Deputy Mayor (Councillor J. Howell) and Alderman D. L. Lipson added their tributes. It was agreed to appoint Mr. Bache consulting electrical engineer for two years from the date of his retirement.

Mr. S. T. Allen, M.I.E.E., who has been the Central Electricity Board's district manager in Central England since the adoption of the grid scheme for that area in 1928, has intimated his desire to retire at the end of October, and the Board has appointed **Mr. W. S. Burge,** A.M.I.E.E., its deputy manager and operation engineer for South-East and East England.

Mr. Allen was born at Plymouth in 1873 and was educated at Plymouth and Mannamead College and Cardiff University College. He was an articled pupil with S. E. Walker & Co., Cardiff, and subsequently became engineer representative in South Wales to Gilbert & Co., London, and electrical engineer to the Ebbw Vale Steel & Iron Co. He then returned to Plymouth as senior charge engineer and was later promoted to assistant borough electrical engineer, and from there went to Carlisle in 1908 as city electrical engineer, staying there for five years. Then, after serving as borough electrical engineer of Wolverhampton, he was appointed chief engineer and general manager to the West Midlands J.E.A. He became Central England manager of the Central Board in 1928. His wide and varied experience has been placed at the disposal of the electrical industry by his connection with the I.M.E.A., of which he was president in 1921-22, and during his chairmanship of the E.D.A. Council.



Mr. S. T. Allen

Mr. Allen has always stressed the importance of the commercial aspect of electricity supply and has adopted an optimistic view of the prospects. He was one of the pioneers of the two-part domestic tariff with a ½d. kWh charge, having introduced it into two undertakings thirty years ago.

Mr. Burge, who joined the service of the Board as operation engineer for South-East and East England in 1931, gained his early training and experience in power station operation at Southampton and Wakefield, subsequently becoming branch office manager in North-East England for Dick, Kerr & Co. After service in the last war as a captain in the Royal Engineers, he held an appointment, from 1919 to 1931, in the Steam Turbine and Steam Engineering Department of the English Electric, Co., Ltd. During this period he made two extensive tours in the United States and Canada, the first in 1926 as a member of the International Electrotechnical Commission, and the second in 1928 for the purpose of making a detailed study of the application of high-pressure steam in generating stations. Mr. Burge has been deputy manager of the South-East and East England Area for the past four years.

Mr. W. H. Heaton, who, as we reported in our last issue, recently retired from the position of works manager at the Witton Engineering Works of the General Electric Co., Ltd., after thirty years' service, was apprenticed to Laird Bros., of Birkenhead, and passed the Board of Trade examination for extra first class engineers in 1903. He has been a member of both the Institutions of Mechanical and Electrical Engineers since 1909. In January, 1932, he was elected to the Committee of the Midland branch of the Institution of Mechanical Engineers, of which he is now vice-chairman; he is to be chairman in January next.

Mr. W. H. Heaton

Mr. Heaton joined the staff of the British Westinghouse Co. in 1904, and became assistant superintendent of the engine department at the company's Trafford Park Works. His career with the G.E.C. began in 1912, at a time when the company was largely extending its activities in the field of heavy engineering. He contributed to the success of this department by the clear judgment which he brought to bear on the many manufacturing problems which were encountered. He has always been a strong advocate of the importance of the education and training of the young engineer and took a personal interest in each of the many apprentices in the works.

Mr. Heaton has also played a prominent part in the activities of the Engineering Employers' National Federation. As we reported, Mr. Heaton will continue to serve the company in an advisory and consultative capacity and on special work.

Mr. W. J. Marston, city electrical engineer of Coventry, has intimated his desire to retire at the end of September, when he will have completed forty-two years' service.

Mr. I. S. Plumtree, A.I.E.E., informs us that he has left Siemens Electric Lamps & Supplies, Ltd. (East Midlands) to join Foster Transformers & Switchgear, Ltd., as consulting engineer for industrial power distribution equipment for the whole of the Midlands.

Commander Stephen King-Hall, M.P., the well-known writer on current affairs, has been

appointed chairman of the Fuel Economy Publicity Committee and director of publicity to the Ministry of Fuel and Power. He will carry out the duties of these positions without remuneration.

Mr. H. Pryce-Jones, M.Eng., who is chairman of the Mersey and North Wales (Liverpool) Centre of the Institution of Electrical Engineers for next session, received his technical training at the Manchester College of Technology and the University of Liverpool. He obtained his workshop training with the British Westinghouse and Metropolitan Vickers Electrical Co., at their Trafford Park works, afterwards becoming an assistant in the large electrical machine testing department and later an engineering assistant in the general engineering department, mining section. He left in 1923 to take the engineering degree course at the University of Liverpool, during which time he was for one session chairman of the Students' Section of the Mersey and North Wales (Liverpool) Centre and was awarded a Students' Premium by the Institution.

Mr. H. Pryce-Jones

After some sea-going experience as a marine engineer in the Merchant Navy, Mr. Pryce-Jones joined the Liverpool Corporation Electricity Department in 1928 as an engineering assistant, later becoming successively technical assistant, chief technical assistant, and deputy city electrical engineer, which position he now occupies. From 1927 to 1933 he was part-time lecturer in electrical engineering at the Birkenhead Technical College. He holds the degree of Master of Engineering of Liverpool University, and is a member of the Institution of Civil Engineers as well as of the I.E.E. He served for a number of years as an officer in the Royal Engineers and Royal Army Ordnance Corps, Territorial Army and Supplementary Reserve, attaining the rank of captain. He is now second-in-command of a battalion of the Home Guard with the rank of major.

Mr. F. Ayton, Ransomes, Sims & Jefferies, Ltd., is one of the employers' representatives on the reconstituted Eastern Regional Board of the Ministry of Supply. Another member is **Mr. T. W. Cooper,** of the Hoffmann Manufacturing Co., Ltd.

Mr. E. J. Taylor, district engineer (Solihull and Warwickshire), Birmingham Electric Supply Department, has been appointed works engineer in the Birmingham Salvage Department.

Mr. C. H. Nicholson, A.M.I.Mech.E., A.M.I.E.E., who has been appointed L.N.E.R. docks machinery engineer, was for a time with the Hull Corporation Electricity Supply Department. Later he was electrical engineering assistant to the chief engineer of the former Hull and Barnsley Railway and following the formation of the L.N.E.R. he became an assistant mechanical engineer. In 1930 he was appointed mechanical engineer, Grimsby and Immingham and in 1936 district docks machinery engineer, Hull.

Ashton-under-Lyne Council has appointed **Mr. J. Bell,** of South Shields, to the position of shift charge engineer.

Mr. William E. Knox, director and assistant general manager of the Westinghouse Electric International Co., has received the Chilean Order of Merit, the country's highest civilian decoration with rank of Commander, for "loyal services and co-operation in the industrial development of Chile." Mr. Knox first became interested in Chilean problems in 1922 when he was a sales clerk in the Westinghouse New York office and a large order had been placed for the electrification of the Chilean State Railways.

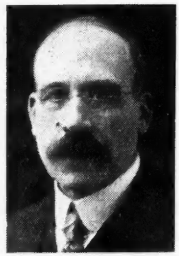
Mr. N. H. Miller has been appointed London branch manager of British Insulated Cables, Ltd., in succession to **Mr. H. J. Stone** who, as recently announced, has become home sales manager.

Obituary

Lieut.-Col. J. R. Kennedy.—We regret to learn of the death on active service in Libya of Lieut.-Col. J. R. Kennedy, A.M.Inst.C.E., A.M.I.E.E., Royal Engineers. Col. Kennedy was awarded the D.S.O. in 1940, and received the O.B.E. for distinguished services in the Middle East during 1941. Before the war he was a member of the staff of Merz & McLellan, Newcastle-on-Tyne.

Mr. S. Hitchcock, of Leeds, who was killed in a recent air raid, was formerly with the General Electric Co., Ltd., at Leeds. He was fifty-two years old and latterly had been assistant area officer of the Ministry of Supply. He was a graduate of London University. His wife was also killed in the raid.

Mr. J. J. Rawlings.—It is with regret that we have to record the death of Mr. John Joseph Rawlings, chairman of the Rawlplug Co., Ltd., which occurred on August 4th at the age of eighty-two. Mr. Rawlings was educated privately, at St. Mark's, Chelsea, and the City and Guilds Institute, Finsbury. He started his business career in South Kensington with his brother, Mr. W. R. Rawlings, in 1886, as general engineers, and he became joint managing director with his brother when Rawlings Bros., Ltd., was formed in 1900. Several subsidiary companies were formed during the ensuing years. Mr. Rawlings was the inventor of the "Rawlplug" and also designed and constructed a special machine necessary for its manufacture. Many inventions were associated with his name, including fixing devices and precision tools. He was a silver medallist at the first Polytechnic exhibition held over sixty years ago, where he exhibited a blow-lamp for making plumbed joints and joints for lead-covered cables. He was also a director of the Sun Electrical Co., Ltd. Mr. Rawlings was a member of the Society of Engineers, a member of the Council of the Motor Trades Association and a fellow of the Royal Society of Arts.



The late Mr. J. J. Rawlings

Mr. C. F. J. Tranter.—The death is announced at Erdington, Birmingham, of Mr. C. F. J. Tranter, aged ninety, who was for twenty-eight years a magistrate for that city. His business interests included that of director of J. H. Tucker & Co., Ltd.

Mr. J. Anderson.—We learn with regret of the death on August 14th of Mr. James Anderson, M.I.E.E., who had been chief engineer of George Ellison, Ltd., for the past twenty-eight years. The early years of his professional life were spent in South America and at the age of twenty-seven he was chief engineer at the Rosario power station. Later he joined the staff of Ferranti, Ltd., and as outside superintendent was responsible for the erection of equipment in this country and in the South African goldfields.

Mr. Anderson joined the staff of George Ellison, Ltd., in 1914, and during his association with the company his activities were mainly directed to research. He wrote numerous papers and Press articles and was the author of "A Study by Means of Photography of the Interruption of Medium Power Electrical Circuits." He gave considerable thought to the status of staff men, at one time actively supporting the Society of Technical Engineers. Mr. Anderson was sixty-nine years of age.

Mr. John G. Little, whose death has occurred at Hexham, Northumberland, was a director of the old Hexham Electric Co., before it was merged with the North-Eastern Electric Supply Co., Ltd.

Mr. F. Fairley.—The death occurred on August 3rd, at Frankston, Australia, of Mr. Frank Fairley, M.I.E.E.

Mr. F. J. Sykes.—We regret to record the death of Mr. Frederick John Sykes, managing director of the W. R. Sykes Interlocking Signal Co., which has occurred following an operation at the age of sixty-nine.

Major James W. E. Avern, managing director of Radiovisor Parent, Ltd., has died at Roehampton at the age of sixty-four.

Mr. M. Buchan.—The death occurred at Glasgow on August 6th of Mr. Murdoch Buchan, superintendent engineer, Waygood-Otis, Ltd.

Will.—Mr. J. Fraser, a director of the General Electric Co., Ltd. and of other companies, left £69,618 with net personalty £54,529.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Institution Membership

BEFORE the closure is put on this correspondence may I briefly express the views of a disappointed, but satisfied, applicant for corporate membership?

I passed the (then) graduateship examination in 1928. I then became a control room operator at a central station and, in due course, asked my chief to support my application for transfer to associate membership. He—not an I.E.E. member himself—declined, saying that the "responsible engineers" at that station were the charge engineers only. I thought differently, but deferred my application until, a year or two later, I had added experience as a technical editor.

The Institution sent me a transfer form. I carefully read it, decided I did not qualify, and so did not apply. Now, I knew the I.E.E. rules on the subject when I took that examination. I planned my subsequent career knowing those rules. If my experience does not conform to them, how can I blame the I.E.E.? It is a fact that my power-station position was "recognised" a few months after I left, but I do not care to hunt a dead hare.

For what it is worth, here is my advice: study the I.E.E. rules and, if you want corporate membership, plan your career to fit it. If your employer baulks you by "writing down" your status, or if you branch off into by-paths, distinguish between such obstacles (which are your own private worries) and any for which the I.E.E. really can be held responsible. For myself, I had rather be a graduate of an institution with a first-class membership than a corporate member of a second-class institution.

Finally, Mr. J. W. Thomas's thoughtful article in your issue of August 7th may eventually influence the present subject, and is much worthier of serious consideration.

Burnham, Bucks. GRADUATE.

YOUR correspondent, Mr. W. Mitchell (July 31st) is not quite logical, for in saying that he did not care to risk a *second* "rebuff," he implies that he did invite one when first applying for membership fourteen years ago. What would be the value of an institution the application for membership of which guaranteed 100 per cent. certainty of no "rebuff"?

Again, if your correspondent really believes that his sponsors are the best adjudicators of the merits of his application, ought he not to feel satisfied in that his case is not in the hands of persons less able?

On the bold assumption, however, that an institution is the best judge of whether an applicant is suitable for membership, is it wise to be too prone to pique? At least one afterwards eminent judge of the High Court was refused "silk" on first application.

Denham. R.B.

The I.E.E. Council

WHILE there is a certain amount of justification for some of the arguments advanced by Mr. Thomas, nevertheless most corporate members would agree that the Institution has been extremely well conducted, and that in the past forty years its prestige has increased enormously.

Any association—a cricket club for that matter—is always run by a comparatively few zealous members who are prepared to give up the necessary time ; but it should not be overlooked that, as a matter of fact, the associate members control the affairs of the Institution by reason of their numerical superiority.

In any case, no one has, or should have, any time to spare on such matters at the present time.

A. S. HERBERT, M.I.E.E.

*London, E.C.*1.

THE article by Mr. J. W. Thomas and Dr. Hughes' letter are very timely and indicate the state of affairs within the institution. For the past two years the Institution has from time to time published its proposed plans for a better world in so far as electrical engineers are concerned, but it has occurred to me that little has been said of putting its own house in order.

The need for doing so is apparently in the minds of many other members and it would give a lead to other institutions if such steps were taken before the head-turning enthusiasm of victory is upon us.

Dr. Hughes says: "It would appear that official nominations are more influenced by 'big business' than by individual contributions to the activities of the Institution." My own experience has led me to believe that many of the social functions arranged by the Institution would be a complete failure if it were not for the whole-hearted co-operation of the manufacturers' representatives, many of whom are members but no doubt have the backing of their firms.

I know of many older members who do not participate in its activities chiefly because of the business attitude referred to by Dr. Hughes, but I do feel that the powers that be could clear the air in this respect and so foster the spirit of goodwill among men. In so far as election to the Council is concerned, it is up to the members to vote accordingly.

Shipley, Yorks. T. H. CARR, A.M.I.E.E.

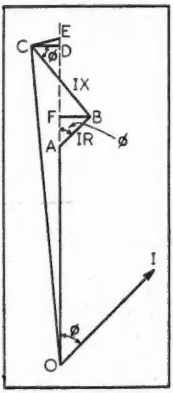
MKS Units

WITH reference to the article by Mr. Ferreira on the Giorgi MKS system, I notice that the author has referred to the gramme (or kilogramme) as the unit of both mass and weight. From recent German publications it is, perhaps, interesting to note that a circular issued by the P.T.R. (the German equivalent of N.P.L.) in 1939 has introduced the new term "Kilopond," abbreviated Kp, as the unit of weight, reserving the old term "kilogramme" for exclusive use as the unit of mass.

London, S.W.1. P. F. STRITZL.

Voltage Regulators

IN the article on this subject in your issue of July 10th, the formula given for "drop at p.f. unity" on p. 45 is incorrect. In the particular example chosen the error is negligible, but if the same formula were used for calculating the regulation in a circuit containing considerable reactance the error might be serious.



Voltage regulation diagram

In the accompanying diagram let OA = voltage at current I p.f. cos ϕ, AB = IR drawn parallel to current OI, and BC = IX drawn normal to current OI. Then OC = open-circuit voltage.

With centre O and radius OC draw an arc cutting OA produced in E. Drop perpendiculars from B and C to OA produced meeting the latter in F and D respectively.

Voltage drop = OC $-$ OA = OE $-$ OA = AF + FD + DE = AB cos ϕ + BC sin ϕ + $\frac{CD^2}{2OE}$ $-$ DE.

DE is usually negligible compared with 2OE, thus voltage drop = IR cos ϕ + IX sin ϕ + $\frac{(IX \cos\phi - IR \sin\phi)^2}{2E}$ where E is the open-circuit voltage.

At unity p.f. cos ϕ = 1, sin ϕ = 0, thus voltage drop at unity p.f. = IR + $\frac{(IX)^2}{2E}$.

In transformer calculations, resistance and reactance voltages and regulation are usually expressed as percentages. Thus, if I_F = full-load current, $R_C = \frac{RI_F}{E} \times 100$ = per cent. resistance drop, and $X_C = \frac{XI_F}{E} \times 100$ = per cent. reactance voltage, regulation (per cent.) = $R_C \cos\phi + X_C \sin\phi + \frac{(X_C \cos\phi - R_C \sin\phi)^2}{200}$ and at unity p.f. regulation (per cent.) = $R_C + \frac{X^2_C}{200}$.

These formulæ do not apply, however, when resistance and reactance are in ohms.

North Wembley, Middx. H. M. LACEY.

COMMERCE and INDUSTRY

Temporary C.E.B. Loans. First Fuel Prosecutions.

Wimbledon Pension

AT a recent special meeting of the Wimbledon Town Council the Town Clerk was instructed to take the necessary steps to resist the application by Mrs. Lindner, wife of a local councillor, for an injunction restraining the Corporation from paying Mr. A. E. McKenzie, the borough electrical engineer, a retiring allowance of £2,426 per annum. The Town Clerk reported that an application was to be made to the Master in Chambers to state that there was no ground for action.

Mrs. Lindner's application is based on the fact that £3,000 of Mr. McKenzie's present salary is paid to the Corporation by the London and Home Counties Joint Electricity Authority and, it is claimed, should not be taken into account in assessing the retiring allowance.

Central Board Finance

The Central Electricity Board (Civil Defence) Borrowing Regulations, 1940, set out the method to be adopted by the Board for raising temporary loans to meet expenditure incurred in civil defence measures. Amendments are made to these arrangements by an Order bearing a similar title just made by the Minister of Fuel and Power. This provides for the opening of a Temporary Borrowing Account in connection with the Electricity (Civil Defence) Fund "to which shall be carried such sum as shall in any accounting period be included for such purpose in estimates submitted to, and approved by, the Commissioners in pursuance of paragraph 6 (1) of the First Schedule to the Civil Defence Act, 1939, for or towards repaying any sum or sums temporarily borrowed". The paragraph referred to provides that the Electricity Commissioners shall pay to the Board interest and sinking fund charges, etc., recovering them separately from authorised electricity undertakings. The methods of repaying temporary loans are also specified.

Fuel Waste Charges

At the Bow Street Police Court on August 12th the first cases under the Waste of Fuel Order were heard. The first summons related to the Dorchester Hotel, Ltd., Park Lane, W. It was stated for the prosecution that on July 14th, a fortnight after the Order came into operation, inspectors visited the Dorchester Hotel and found 76 electric lamps burning although the ballroom was merely being used by waiters passing from the kitchen to the restaurant. It was found that two-thirds of them were unnecessary.

For the defendants, who pleaded "Guilty," it was stated that they had engaged an electrical engineer to advise on economies and he had made substantial savings. The floor managers had been instructed to reduce the lighting and the person responsible for the waste had been reprimanded. The magistrate (Sir Bertrand Watson) recorded a conviction and imposed a fine of £15, with ten guineas costs.

In the second case, the General Theatres Corporation, Ltd., was found guilty of permitting the use of excessive lighting in the vestibule of the Prince of Wales Theatre, Coventry Street, W, and similar penalties were inflicted. In their defence the company pleaded that they had effected a 50 per cent. reduction in the lighting of the theatre. The lamps in the vestibule were on for half an hour only while 1,200 people were entering the building.

The third summons, against the Strand Hotel, Ltd., for the alleged excessive use of lighting at the Strand Palace Hotel, was dismissed and costs amounting to £15 15s. were awarded the defendants. An enforcement officer of the Ministry of Fuel was questioned by counsel for the defence. He admitted that he had not measured the illumination in the parts of the hotel about which he complained and that he had not been trained to make such tests. Mr. R. O. Ackerley, president-elect of the Illuminating Engineering Society, giving evidence, said that there was no waste of light in the hotel.

The defendants' counsel entered a protest against the publicity given to the issue of the summonses by the Press and the B.B.C. Sir Bertrand Watson said that he considered the protest to be amply justified. An apology had been sent to the Court and had been fully accepted, but applications for summonses were private and should be treated as such. Often after they had been applied for summonses were not proceeded with for various reasons.

At Solihull, Birmingham, on August 13th, Doreen Satchwell, Hall Green, was fined 10s. for wasting electricity. It was stated that this was the first case of a householder being so summoned, and Mr. John Burman, the chairman of the magistrates, stated that in future much heavier penalties would be imposed.

Supply Industry Wages

In connection with the recently reported increase in the war bonus payable to employees in the electricity supply industry (from 3½d. to 4d. per hour), it should be noted that it has been agreed by the National Joint Industrial Council for the industry that there shall be no further alteration of the bonus until February 1st, 1943. The bonus applies to all zones and is reckoned in the calculation of overtime.

Non-Ferrous Metal Production

In order to stimulate the production of non-ferrous metals which are vital in the conduct of the war the Ministry of Supply is organising a special campaign in works engaged in this industry.

The first "shot" in the campaign is a series of four bulletin-posters effectively showing our Forces in action and impressing upon the reader the continuing need of these men for more and more non-ferrous metals. With the general title "Battle!", these posters bear photographic scenes of the Navy, Army and R.A.F. engaged in their onerous and hazardous operations and are well calculated to impress the accompanying exhortations upon the mind of the worker.

Bulletins are to be issued from time to time for pasting on the posters to bring them up-to-date and leaflets giving more detailed facts about the importance of brass, copper and zinc alloy die castings are being prepared for distribution to selected works. Serving soldiers just back from the battle fronts will give talks on their personal experiences in which they will lay stress upon the important part played by non-ferrous metals.

Power Engineers' Salaries

From the beginning of 1941, the employees' side of the National Joint Board of Employers and Members of Staff (Electricity Supply) Industry agreed that in calculating the adjustment of salaries in accordance with the rise in the cost of living the tax component of the official Ministry of Labour index should be ignored. It was hoped that this example would be widely followed throughout industry but, in fact, this has not been the case and members of the Electrical Power Engineers' Association have therefore urged that the original procedure should be reverted to.

Now it is announced that the National Joint Board has decided to cancel the arrangement and on October 1st there will be a special adjustment of salaries, based upon the full cost-of-living figures for the months of April to September, 1942, particulars of which will be published as soon as possible. Thereafter salary adjustments will be made in accordance with the original Clause 39 of the N.J.B. Schedule.

Unreasonably Fine Limits

In the Ministry of Supply Eastern Regional Bulletin (No. 104) Sir Alfred Herbert deprecates the practice of some designers insisting on production to extremely fine limits when over-precision is not essential. He suggests that they should ask themselves : "What are the widest limits that can be allowed without detriment to the satisfactory functioning of the finished job ?" More trouble arises in many classes of work through fits being too tight rather than too slack ; tight fits involve unnecessary fitting, difficulties in lubrication and consequent seizing up. Sir Herbert is confident that there are thousands of jobs now being done in which limits might be increased and much larger output attained without any sacrifice of ultimate efficiency.

Milling Machine Accident

A fine of £100, the maximum penalty, was imposed on Electrical Utilities, Ltd., Rosedale Works, Richmond, at Richmond Police Court recently when the company was summoned because the cutter of a horizontal milling machine was not securely fenced. It was stated that a young married woman, Mrs. Tyrrell, who had been employed for about a month, was working the machine when her hand came into contact with the cutter and was severed at the wrist. An inspector expressed the opinion that if the machine had been fitted with a guard the accident would have been averted. The importance of the best possible guards being provided on such machines especially at the present time when there were so many inexperienced workers was stressed by the District Factory Inspector.

Evidence was given by Mrs. Tyrrell that there was no guard whatever on the machine, which she had been working since the Monday before the accident. She had been shown how to do the job and half an hour later was doing it. The machine was difficult to work.

Mr. L. S. Howard (managing director) stated that the machine was provided with a guard and it was the duty of the foreman to see that it was attached. The foreman in question had been found to be unreliable and had since been discharged. He claimed that there had been a certain amount of contributory negligence ; the worker should not wear a glove, which might get caught, and if she found that there was something wrong with the machine she should stop it and call the setter.

Opening of New Shops

The Location of Retail Businesses Order, 1942 (S.R. & O. 1942 No. 1619) just issued by the Board of Trade supersedes the Location of Retail Businesses Orders, 1941 (S.R. & O. 1941 Nos. 1784 and 1933). It makes it necessary for all traders in goods covered by the Order (*i.e.*, most non-food goods) to apply for licences if they wish to start a new retail business.

The purpose of the new Order is to consolidate the provisions of the 1941 Orders and to deal with the situation which has been created because advantage has been taken of a loop-hole created by the goodwill clause in the (No. 2) Order which dispensed with the need for a licence where the goodwill of an existing business was acquired by operation of law or otherwise. It has, however, led to undesirable dealings in fictitious goodwill. The Local Price Regulation Committees, who grant licences under this Order on behalf of the Board of Trade, will accordingly give favourable consideration to applications for licences when there is a real transfer of goodwill, but in general they will consider applications for licences in relation to the local need for a new business or the extension of an existing business.

Strike Investigation

As the outcome of three strikes in South-East Scotland a Committee was set up under the chairmanship of Lord Wark to investigate the causes. In its report the committee criticises both parties to the dispute, which involved at one time 3,000 men. It appears that it was proposed to transfer a shop stewards' committee convener to another firm and the strikes were called by the shop stewards to enforce his reinstatement after an appeal board had declined to stop the transfer.

The investigating committee says that an allegation that the man was selected for transfer because of his trade union activities was not proved and no question of personal hardship was raised. Machinery had been established to deal with such matters; it should have been employed to prevent the interruption of important Government work. The admission of the claim of a shop stewards' committee to be able to act, apart from the trade unions, as a negotiating body would destroy all confidence between employers and workers. The employers concerned had acted in a manner which was likely to raise false issues and persisted in their request for transfer of the shop steward in spite of plain indications of impending trouble.

The committee thinks that the existing transfer machinery should be adjusted to meet the special cases of shop stewards and trade union representatives to remove any suspicion that men are being moved on account of their union activities.

Commodity Insurance Premium

The Treasury has approved a Board of Trade proposal that the rate of premium for policies issued under the Commodity Insurance Scheme shall continue to be at the rate of 5s. per cent. per month for the quarter from September 3rd to December 2nd.

Electric Clock Gift to Coventry

As a tribute to the people of Coventry's courage during the heavy air-raids a double-fronted bracket type electric clock has been presented to the city by English Clock Systems, Ltd., the cost of installation being borne by R. A. Poole (London), Ltd. The clock, which has been installed over the street traffic island at the bottom of Trinity Street, was formally handed over recently at a ceremony attended by the Mayor and other members and officials of the Council.

Record Salvage

The British Legion, in co-operation with Odhams Press, Ltd., and the gramophone record manufacturers, is conducting a " drive " for the collection of old records which contain much shellac which can be re-used. Those who have such records (not cracked or broken ones) are asked to send them to the local branch of the Legion which will arrange to return them to the manufacturers. The proceeds will be divided equally between the Legion's funds and the Hospital for Sick Children, Great Ormond Street, London.

Mica Sales

Companies which have been engaged in selling raw mica are asked by the Ministry of Supply to send a statement of the sterling total of the sales of raw mica in its imported form (block or splittings) which they made in the year 1941 directly to processors and/or users in the United Kingdom. Sales made through brokers or other intermediaries should be excluded from the statement which should be sent to the Director for Sundry Materials, Ministry of Supply, Melbourne House, Aldwych, W.C.2. This step is taken in connection with the arrangements being made for the distribution of raw mica, of which the Ministry will be the sole importer.

Fatality

A ploughman recently received a fatal electric shock while removing an implement which had made contact with an overhead electric line on a West Lothian farm.

American Cable Works Taken Over

As a consequence of a strike of about a thousand employees the Bayonne (New Jersey) works of the General Cable Corporation, which is engaged on important war orders, has been taken over by the United States Government. The strike was due to the refusal of a wages increase to the men by the War Labour Board. It was reported that strikers were returning to work after the re-opening of the works by the authorities.

American Power Projects Halted

Reuter reports from Washington that the War Production Board announced on August 13th that it had stopped all construction of electric power projects because of the need of the armed forces for copper and steel.

Control of Appliance Manufacture

An Order being issued by the Board of Trade (S.R. & O. 1942 No. 1620; 1d.) amends a number of previous Orders, including the Electrical Appliances (Control of Manufacture and Supply) Order, 1942, to make them apply to firms in which more than four people are engaged in the actual production of any goods (*i.e.*, irrespective of the number engaged in the production of goods controlled by the individual Orders) so that such firms will require licences before they can continue to manufacture controlled or prohibited goods after August 21st.

Trade Announcement

The Progress Cables & Accessories Co., Ltd., has appointed Mr. H. C. Hopkins, of 173, Glenfield Road, Western Park, Leicester, as representative for the Leicestershire, Nottinghamshire, Northampton, Peterborough and area.

TRADE MARK APPLICATIONS

RECENT applications for British trade marks included the following, objections against which may be entered within a month of August 12th.

WORTLEX. No. 619023, Class 7. Electric motors (not for land vehicles), machine couplings and machine belting. J. C. Wortley and Madge Wortley, trading as Wortleys, 37, Lepping Lane, Sheffield.

L. & M. (design). No. 617198, Class 11. Electric heating apparatus and parts thereof for use with typographical composing machines. Linotype & Machinery, Ltd., 9, Kingsway, London, W.C.2.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

CAMPBELL cooker (Campbell Electrical Equipment Co.) present address.

Contractors' Notes

Transferred Employees

IT will be remembered that an investigation was carried out a few months ago by a committee under the chairmanship of Sir William Beveridge into the extent to which skilled craftsmen were employed in the Forces on work other than that for which they were particularly fitted. Steps have since been taken to improve the situation, including the formation of the Royal Electrical and Mechanical Engineers corps.

Another aspect of this matter has been raised by members of the Electrical Contractors' Association who state that men have been taken from them and sent to places where a substantial amount of their time seems to be wasted either because their skill is not effectively used or because there is already a redundancy of electrical labour on the new job.

The Association has already made representations to the Ministry of Labour and National Service and the Director (Mr. L. C. Penwill) asks for evidence from members to reinforce those representations. They should give the full names and addresses of the men concerned; the nature of the work upon which they were previously engaged; the date of their transfer to other employment; the nature of this employment; whether they are being effectively used in their skilled capacity; and whether the electrical staff on the jobs to which they have been directed is greater than is reasonably necessary.

Payment of Boy Labour

In a letter circulated in July Mr. Penwill set out the hourly rates to be paid to employees under twenty-one years of age. In response to questions from members he now states that these youths are entitled to a proportion of the cost-of-living war addition as follows :—Under the age of 18, 25 per cent. of the addition; between 18 and 21, 50 per cent.

Unused Appliances

American Redistribution Scheme

WHILE seeking ways and means of aiding their residential customers to make better use of the facilities offered them some suppliers of electricity in the United States have recently been carrying out surveys to find out the extent to which unused household appliances might be repaired and redistributed. The resulting data constitute useful indicators in several ways. For instance in one locality in Indianapolis 8.4 appliances (of the ten most common types) per home were found in a thousand middle-class houses. About 57 per cent. were less than five years old and 15.6 per cent. older than ten years. Approximately 9 per cent. were reported to be not in active service, about one quarter because of the need for repair ; different reasons accounted for the non-use of the other three-quarters.

The last-mentioned figure has prompted the suggestion, which is worth bearing in mind in case of need here, that means might be devised of redistributing such unused appliances as may be in reasonable condition to families anxious to employ them, but unable to buy new ones during the war period. In advocating the organised resale in this way of good second-hand appliances, reconditioned when necessary, the *Electrical World* points out that a fair proportion of the community, particularly women who indertake industrial tasks in addition to their house work, should not be deprived of such labour-saving devices as will release their time and energy for war work.

The number of appliances not in constant use, both because of disrepair and other causes, appears, not unexpectedly, to increase rapidly with their age. If this is the case normally when there should be little difficulty in having them attended to, how much greater will the "outage" become when replacements are almost unobtainable, unless definite efforts are made to keep apparatus in regular service ?

A novel way of doing so seems to be succeeding in Kansas City where door-to-door appliance repair vans have been operating for the past two years. By continuing this service to customers it is hoped to preserve sales staff and, at the same time, maintain revenue. It is recognised that service operation in this manner is expensive, but the load recaptured by putting old apparatus back into use is said to have justified the direct cost. For example, last year 10,165 appliances were repaired, all small ones. The idea is based on the belief that idleness is the result of some member of the household not troubling to carry the appliances round to the local repair shop. The scheme is being operated in conjunction with a free lamp renewal service which provides a means of approaching customers.

Surplus Capacity

Employing Back-pressure Plant

ON July 2nd, 1940, the Electricity Commissioners sent a circular letter to electricity undertakings dealing, among other matters, with the possibility of making use of any surplus private generating plant capacity to augment public supplies. Apart from the foregoing consideration and in view of the imperative need now to reduce coal consumption, the Commissioners have been asked to co-operate in securing—in appropriate cases—the best possible use of back-pressure generating plants.

It may be that owing to the conditions under which public supplies of electricity are furnished to premises where such plants are installed, the steam required for heating or process work is not used to the fullest possible extent for the generation of electricity. In these circumstances the Commissioners ask that consideration should be given in any appropriate cases during the present emergency to the relaxation of any imposed conditions of operation which may be precluding the most economic use of private generating plants; and that further consideration should be given to arrangements by which any surplus electricity so produced could be economically absorbed into the public supply system.

To assist engineers in dealing with any of the problems involved, the Commissioners offer to arrange for one of their Engineering Inspectors to discuss the matter with them.

Development Officers

Training Scheme for Men in Forces

By G. A. T. Burdett, A.I.I.A.

VERY little foresight is required to appreciate that when hostilities cease and the present electricity-gas truce ends, the development of electricity will go ahead at an unprecedented rate. The depleted development staffs of electricity supply undertakings will require reinforcement and difficulties may be met in obtaining the right type of personnel.

Many development officers now serving in the Forces will return to their previous positions as will others who have taken up other war work. Some will have left the industry altogether and a number of those in the Forces may remain there for some years after the war should the Government decide to retain substantial armed forces for a considerable period. The net result will be that fewer experienced development officers will be available at the end of hostilities than there were in September, 1939, while the need for them may be greater. Consequently a reserve "army" of development officers should be trained as soon as the personnel is available.

The author, who is himself on active service and was a development officer, makes suggestions for ensuring an adequate supply of trained, or trainable, men from the Services for the post-war electrical campaign

In the past development officers have not received any standard or conventional training. Recruits were drawn from electrical contracting and manufacturing, various departments of electricity supply and also direct from other callings. The last-named group practically filled the ranks of junior sales representatives and canvassers.

It is to be deplored that there should be no real training system. A few of the larger supply authorities did inaugurate schemes for their own personnel, particularly for the more junior employees of the sales representative class, and E.D.A. launched a campaign in domestic salesmanship, when certificates were presented to successful candidates after a written examination. This was extended to include sales engineers who, having obtained the certificate in domestic salesmanship, were invited to qualify for a sales engineers' diploma. The minimum qualifications required were:—(*a*) Candidates had to hold the National Certificate in Electrical Engineering or its equivalent; (*b*) they had to pass a viva-voce examination; (*c*) a satisfactorily completed questionnaire on the candidates' work had to be received by E.D.A. from their undertakings; and (*d*) they had to have been employed for a period of not less than three years on development work with a supply authority.

Rather than training new personnel, the above scheme served largely as a means of grading experienced development officers whose qualifications reached a minimum standard. Untrained or otherwise unsuitable personnel were weeded out, there being no scheme whereby such personnel and recruits could be trained.

Training of development officers must be an essential part of any successful post-war campaign if the electrical industry is to recapture its prominent position as a means of providing light, heat and power. One must not lose sight of the fact that development has not only ceased during the war but consumers are becoming used to doing without appliances.

Any scheme of training to aid reconstruction after the war is bound to receive Government sympathy as well as its support. One of the most difficult questions will be the replacing in peacetime industry of the men released from the armed forces, civil defence and war manufacture. In addition to those who are absorbed into electricity supply as a result of any well-planned electrical development campaign, there will be a larger number employed in the manufacture of equipment and appliances.

As a means of obtaining the necessary personnel and providing them with training, the following provisional suggestions are offered.

(1) A representative body such as E.D.A. should, as soon as practicable, ascertain in collaboration with the Incorporated Municipal Electrical Association and electricity supply companies' associations (*a*) The approximate number required in the first years, and (*b*) the approximate number available, including those in the Forces who can be expected to return to their previous employment.

(2) E.D.A. should compile a register similar to the Central Register of Scientific Workers.

(3) Immediately before the commencement of demobilisation, E.D.A. should get into touch with the Education Officers of the three

fighting services, civil defence and the Ministry of Labour and arrange for all those interested to give details of their qualifications, education, experience in the electrical industry (if any), etc. The completed questionnaires should preferably be returned direct to E.D.A., where they would be classified.

Many applicants with experience would, no doubt, be absorbed fairly quickly, and the service concerned would arrange for their early release. Others, with little or no electrical or selling experience would either be rejected and advised to seek other employment or they would require special treatment. Having obtained a "paper reserve" of development personnel, electricity authorities should then convey their immediate requirements to E.D.A. when particulars of likely applicants would be supplied.

Regarding the half-trained and untrained personnel who would require special treatment, the following suggestions are made:—Proposals have been put forward by interested parties that the younger members of the fighting forces should, before demobilisation, undergo a short refresher course of training to equip them for peacetime employment. Under such arrangements E.D.A. could provide, through the service schools, training in subjects essential to development officers. During the course and afterwards, arrangements could be made for students to spend a few weeks in certain departments of electricity supply undertakings, *e.g.*, appliance maintenance, installation, estimating, sales and consumers' departments.

Subjects for Courses

The subjects taught in the service schools would include:—Revision of the fundamentals of electricity; wiring installation schemes; tariff considerations and construction; the design of water-heating, space-heating, lighting and cooking schemes, etc.; and electrical salesmanship.

The students should be given both written and oral examinations and consideration should be given to reports from electricity undertakings where the student had received courses in practical training. Similar arrangements should be made for civil defence and other personnel.

The results of the examination would be inserted on the record cards of the E.D.A. register and successful candidates would be placed in positions in supply undertakings where they would serve a probationary period. After this they would follow their new profession in the usual way. Candidates who proved to be unsuitable would, of course, take up other employment.

How far the preliminary training (other than the practical part) could be applied during the war is difficult to conjecture, though consideration might be given to it. It is well known that a large number of soldiers, sailors and airmen are taking advantage of the correspondence courses provided to all interested personnel at a nominal figure and off-duty classes are well attended. The main difficulty the service man finds when proposing to take up some form of study is whether employment will be available where the extra knowledge gained will be utilised. Many of the subjects, of course, are of purely academic interest. If it were possible in present circumstances for the electricity industry through, say, E.D.A. to take the long view and submit to the respective service departments a comprehensive correspondence course, including some or all of the subjects given above, much of the spade work would be accomplished.

Little Wastage

As service education officers recommend subjects only where these will benefit the student, the proportion of personnel upon whom the value of a course would be lost may be assumed to be very small. In any event, if in some cases the course had only provided recreation, it would have been worth while. By the very nature of the life of a man upon active service, any part-time educational scheme will show indifferent results, but, in view of the many considerations both now and after the war, the possibilities merit investigation.

The training scheme would, of necessity, be based only on a short-term policy and would be sufficient only to meet the abnormal conditions which will arise immediately after the cessation of hostilities. A further permanent scheme, based on experience gained from the provisional one, could be drawn up to enable students to take comprehensive courses in commercial engineering as appertaining to electricity supply. To ensure success, any scheme undertaken must have full support of the industry so that students would be certain of obtaining suitable employment where their particular qualifications would be recognised.

The question of the status of development officers and sales engineers has been the subject of discussion for many years but as yet no sound national scheme has been adopted. It is to be hoped, therefore, that victory will present the opportunity to solve an outstanding problem. At the least it can prevent the loss to the industry of many ex-development officers whose past training and experience is a considerable asset.

Welding Instruction for Inspectors

IN the United States the Lincoln Electric Co. is providing welding instruction for ordnance inspectors. The two weeks' instruction covers the arc welding machine, striking the arc, procedures in welding various types of joints, factors affecting the quality of welds, methods of inspection, stainless steel welding and other important fundamentals.

ELECTRICITY SUPPLY

Sunderland Coal Clause. Ontario Power Demand

Bath.—YEAR'S WORKING.—After the City Council had considered the past year's accounts of the Electricity Department a statement was issued that the results of the year's trading had been most satisfactory. A sum of £7,328 will be transferred in aid of the rates. It is not anticipated that there will be any increase in charges during the current year.

Bolton.—COAL AND ASH HANDLING.—The Electricity Committee has obtained sanction to borrow for coal and ash handling plant and buildings.

Coventry.—WATER TREATMENT PLANT.—The Electricity Committee is to provide additional water treatment plant at a cost of £15,500.

Eccles.—SUPPLY TO FIRE STATIONS.—In reply to a request for preferential terms for electricity supply to fire stations the Electricity Committee has stated that undertakings are precluded by law from showing undue preference to any consumer in the matter of charges and that the Corporation's standard tariffs cannot be varied in the case of premises occupied by the N.F.S. The Committee, however, is agreeable to all the buildings at the central fire station being grouped together for the purpose of assessing the quantity of electricity consumed for lighting and charged for on the standard flat rate for lighting at 3d. per kWh for a guaranteed consumption of not less than 10,000 kWh per annum.

Hebrides. — WIND POWER POSSIBILITIES. — During his tour in the Hebrides Mr. Thomas Johnston, secretary of State for Scotland, suggested to the Lewis and Harris Agricultural Executive Committee that windmills might be used to produce electricity for domestic purposes as an alternative to hydro-electric power, and said that he was going to experiment in his own home. He first referred to the question at a meeting with Harris District Council, where it was suggested that, although hydro-electric developments were of little interest to the Hebrides generally because of an insufficient amount of water power, it might be possible to develop some small-scale hydro-electric schemes in Harris.

London.—POPLAR.—The Electricity Committee is to change over various DC mains to AC in order to provide an adequate supply in part of the area.

A revised scheme for the incorporation of switching relays in the public lighting system at a cost of £1,389 has been approved.

Sunderland.—PROPOSED COAL CLAUSE.—The Electricity Committee has submitted a report to the Council on electricity charges. Owing to an increase of nearly 4s. a ton in the price of coal during the past four months it is proposed to insert the standard coal clause in certain additional tariffs. Under this plan there will be an increase of 0.003d. per kWh for each 3d. increase in the price of coal above 15s. a ton.

As from September 30th an additional 3d. per lamp will be charged to consumers supplied with lamps under the assisted wiring scheme. This amount is to cover half the purchase tax, the other half being paid by the Council.

SWITCHGEAR.—Sanction is sought by the Town Council to the spending of £1,350 on switchgear in connection with an electricity supply to an industrial consumer.

Sutton Coldfield.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £2,260.

Torquay. — BUSINESS PREMISES TARIFF REDUCED.—In view of the fact that it is not now permissible to use shop window lighting the local Chamber of Trade asked for a reduction in the standing charge for business premises, and the Electricity Committee has agreed to make the reduction provided the circuit or circuits are totally disconnected from the supply. It is estimated that the effect of this decision may mean a loss of revenue of approximately £24,285 per annum.

Watford. — DISTRIBUTION. — The Electricity Committee is to augment the supply at a cost of £13,705.

Overseas

Canada. — SHARP RISE IN DEMAND.—As evidence of the mounting demands of war industries for power the Ontario Hydro-electric Power Commission reports that the Niagara System in May recorded its greatest increase with a load of 1,607,909 HP, as compared with 1,255,496 HP for the corresponding month of 1941, representing an advance of 28.1 per cent. The total primary load for May in the five Hydro systems was 2,145,874 HP, as compared with 1,759,419 HP in May last year.

Restrictions on use of power to Ontario are likely to be brought into effect as a war measure by order of the Federal Power Controller not later than October 1st. All display lighting, including lights used in signs and window display, and the use of electric fires in homes are likely to be prohibited, but it is not expected that there will be any restriction in the use of electricity for water heating.

PROTECTING POWER PLANTS.—The Ontario Attorney-General announces that a special branch of the provincial police will be set up to guard the hydro-electric power plants and all Government buildings and works. The new branch will be organised after he has made a personal survey of all power plants. The decision to increase protection against possible sabotage followed the capture in the United States of enemy agents whose plans for sabotage included Niagara hydro-electric plants.

New Zealand.—HYDRO-ELECTRIC DEVELOPMENT.—The spread of the war to the Pacific has made it necessary to reduce development generally to a care-and-maintenance basis, states the *New Zealand Electrical Journal.* Nevertheless the Prime Minister has announced that in view of the shortage of power it is felt that hydro-electric construction work should proceed as far as is practicable and that £1,100,000 will be provided during the current year for this purpose.

Spain.—COMPANY'S INCREASED OUTPUT.—The Sociedad Hidroelectrica Espanola produced 572,600,000 kWh in 1941, as compared with 490,800,000 kWh in 1940. The company's net profit in 1941 was 26,300,000 pesetas and a dividend of 40 per cent is being paid.—*Reuter's Trade Service.*

RADIO & TELEPHONY

Brazil.—TELEPHONE PROGRESS.—The annual report for 1941 of the Brazilian Telephone Co., Ltd., which is one of the affiliated concerns of the Brazilian Traction, Light & Power Co., Ltd., and operates the telephone services in Rio de Janeiro, São Paulo and other towns of the Republic, shows that 20,924 additional telephones were connected to the company's exchanges, making the total number 244,993, and some 200,000 more calls were made than in 1940. A new automatic exchange with 7,000 lines was completed and put in operation at Niteroi during the year. The toll system was extended to São Joao da Berra and Cabo Frio and a connection is also being made with Angra dos Reis. In order to provide additional toll facilities between Rio de Janeiro and Petropolis an underground cable is being laid between Caixas and Petropolis. In the last-named town a new exchange building is ready to accommodate the automatic equipment, delivery of which has been delayed. At the exchange in the town of Sorocaba additional equipment for 300 lines has been installed. Under agreement with the authorities of São Paulo, the company has undertaken to carry out a programme of extension of the telephone system in that city within a period of 32 months. The material for this work has been ordered in the United States and, although a priority rating for its delivery has been secured, some delay may be unavoidable.

Lanarkshire.—POLICE WIRELESS SCHEME.—The County Council at its last meeting approved of a scheme of ultra-high-frequency wireless communication for the police force being carried into effect as quickly as possible. The estimated cost was given as follows: Thirteen station receiver-transmitters, £2,294; fourteen mobile receiver-transmitters, £2,268; plus proportion of cost of transmitter, say, £700, a total of £5,262. It was stated that there was a likelihood that orders placed with Stratton & Co., Ltd., who had just commenced production of apparatus for police purposes, might be delivered at an earlier date than had been hoped.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Berry's Electric, Ltd., reports a profit for the year to March 31st of £28,385, as compared with £14,587 for the previous year, and a net profit of £18,489 (against £7,031), to which is added £1,900 brought in. The dividend for the year is 6 per cent., less tax (against nil) and the balance carried forward is £3,163.

Thorn Electrical Industries, Ltd., who as previously announced, are repeating their ordinary dividend of 20 per cent., report an increase in net profit (including that of subsidiaries) from £25,634 to £33,681. Taxation absorbs £50,000 (against £25,000) and £20,000 (against £15,000) is put to general reserve, leaving £8,918 (£6,733) to be carried forward.

The Power Investment Corporation, Ltd., has decided to pay a dividend of 1½ per cent. on the 5 per cent. cumulative preference shares on September 30th in respect of the dividend then due. There are no standing arrears. The last ordinary dividend was 3½ per cent. for 1938–39.

The Reason Manufacturing Co., Ltd., reports a profit for the year ended January 31st of £4,129, to which is added £3,723 brought in. The ordinary dividend for the year is maintained at 1s. per share and the balance carried forward is £4,328.

Broadcast Relay Services, Ltd.—At the annual meeting on August 14th, Sir H. Brent Grotrian, Bt., K.C., presiding in the absence of the chairman, Mr. A. Miller, said that the additional profits reflected the steady expansion of their subsidiary companies' business. The manufacturing subsidiaries in England had increased their output and had produced several original developments which, they believed, were of value. The Canadian manufacturing subsidiary companies were now getting into their production stride.

In the West Indies they were making satisfactory progress. In Malta although the company had suffered in common with everyone else in the island they had maintained their service thanks to the staff under their manager, Colonel Ellis.

The Oriental Telephone and Electric Co., Ltd., reports a net revenue of £96,279 for 1941 (against £130,465). No dividends were received from subsidiaries; in 1940 the amount was £52,756. The ordinary dividend has been reduced from 16 to 10 per cent. A surplus of £1,015,036 from the sale of holdings in the Bengal, Madras and Bombay Telephone Companies has been added to capital reserve, making £1,193,098. The directors of the Rangoon Company do not propose to pay a dividend for 1941 and in the absence of a final dividend from the Hongkong Company the China and Japan Telephone Co. shows a loss on the year's working.

The Northampton Electric Light & Power Co., Ltd., has declared an interim dividend of 4 per cent. on the ordinary stock (same).

The Rushden & District Electric Supply Co., Ltd., is again paying an interim dividend of 4 per cent.

Waste Heat & Gas Electrical Generating Stations, Ltd., is maintaining its interim dividend at 2½ per cent.

Falk, Stadelmann & Co., Ltd., are to pay a first and final dividend of 7½ per cent. (same).

Davis & Timmins, Ltd., are maintaining their interim dividend at 10 per cent.

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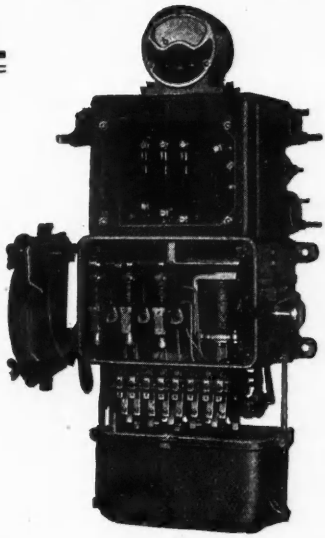

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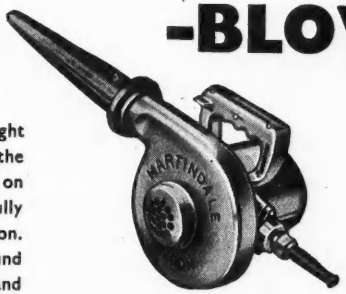

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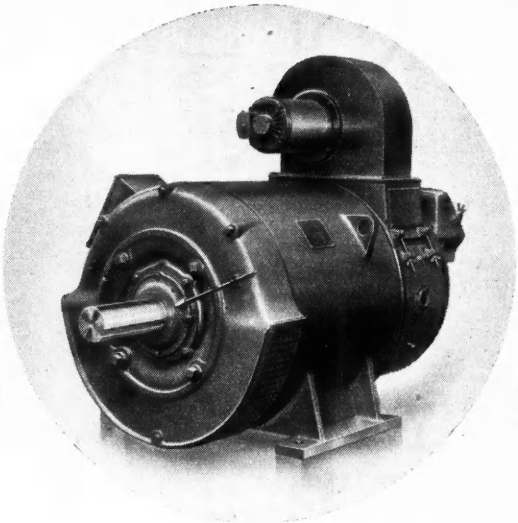

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Starting by **direct switching**

Perfect commutation at all loads and speeds

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Made for **voltages up to 6,600** and outputs from **2 to 500 H.P.**

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LAURENCE, SCOTT & ELECTROMOTORS LTD.

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New Companies

Lan-Elec, Ltd.—Private company. Registered August 8th. Capital, £1,000. Objects : To carry on the business of electrical and general engineers, manufacturers' agents, manufacturers and repairers of, and dealers in, dynamos, motors, armatures, magnetos, batteries, insulators, transformers, stoves, cookers and general electrical plant and supplies, etc. Directors : F. Shirley, 189, Maida Vale, W.9, Constance M. Rudd, 30, The Uplands, Ruislip, Middlesex and A. F. Phillipson, 8, Woodcote Gardens, N.21. Registered office : 322/8, Lanark Road, W.9.

Winter Electric, Ltd.—Private company. Registered August 8th. Capital, £100. Objects: To carry on the business of retail and wholesale merchants, manufacturers, factors, importers, exporters and repairers of, and agents for, wireless apparatus, electrical instruments and accessories, gramophones, musical instruments, domestic appliances, etc. Directors : H. Winter, 318, Park West, Edgware Road, W.2 and H. Lasky, 70, Harrow Road, W.2. Registered office : 68a, Harrow Road, Paddington, W.2.

Cambridge Radio Repairs, Ltd.—Private company. Registered August 6th. Capital, £1,500. Objects : To carry on the business of repairers, designers, manufacturers, factors and hirers of and dealers in, radio and television receivers and accessories, etc. Permanent directors : C. Wilmore, Briarcroft, 89, De Freville Avenue, Cambridge, and three others.

Companies' Returns

Statements of Capital

Northampton Electric Light & Power Co., Ltd.—Capital, £1,000,000 in 925,000 ordinary stock and shares and 75,000 preference stock and shares of £1 each. Return dated March 24th. 870,000 ordinary and 52,500 preference shares taken up. £922,500 paid. (All issued shares have been converted into stock.) Mortgages and charges: £600,000.

Power Securities Corporation, Ltd.—Capital £2,000,000 in 1,000,000 7 per cent. cumulative participating preference and 1,000,000 ordinary shares of £1 each. Return dated March 11th. 500,000 preference and 800,000 ordinary shares taken up. £1,300,000 paid. Mortgages and charges: Nil.

Chesham Electric Light & Power Co., Ltd.—Capital, £300,000 in ordinary shares of £1 each. Return dated March 24th. 265,000 shares taken up. £244,998 paid. £20,002 considered as paid. Mortgages and charges: Nil.

Alton District Electricity Co., Ltd.—Capital, £35,000 in 35,000 shares of £1 each. Return dated March 19th. All shares taken up. £35,000 paid. Mortgages and charges: Nil.

Loch Leven Electricity Supply Co., Ltd.—Capital, £10,000 in 1,000 shares of £10 each. Return dated March 31st. 500 shares taken up. £5,000 paid. Mortgages and charges : Nil.

Croydon Cable Works, Ltd.—Capital, £170,000 in 170,000 shares of £1 each. Return dated March 25th. 700 shares taken up. £700 paid. Mortgages and charges: Nil.

E. P. Allam & Co., Ltd.—Capital, £6,000 in 6,000 shares of £1 each. Return dated April 2nd (filed July 1st) 5,250 shares taken up. £2 paid. £5,248 considered as paid. Mortgages and charges: Nil.

Associated Utilities, Ltd.—Capital, £250,000 in 200,000 ordinary and 50,000 4 per cent. cumulative preference shares of £1 each. Return dated April 2nd. 200,000 ordinary and 31,091 preference shares taken up. £231,091 paid. Mortgages and charges : £100,000.

Elexcel, Ltd.—Capital, £250,000 in £1 shares (125,000 cumulative preference and 125,000 ordinary). Return dated April 14th. 125,000 shares taken up. £2 paid. £214,998 considered as paid. Mortgages and charges : Nil.

D.P. Battery Co., Ltd.—Capital, £100,000 in £1 shares. Return dated April 23rd. All shares taken up. £28,000 paid. £72,000 considered as paid. Mortgages and charges : Nil.

J. G. Sneath, Ltd.—Capital, £3,000 in 3,000 shares of £1 each. Return dated May 6th. All shares taken up. £1,969 paid. £1,031 considered as paid. Mortgages and charges : Nil.

Increases of Capital

S. Dickinson, Ltd.—The nominal capital has been increased by the addition of £9,000 on £1 ordinary shares, beyond the registered capital of £1,000.

Mortgages and Charges

British Radio Corporation, Ltd.—Issue on July 22nd, 1942, of £625 debentures, part of a series already registered. Satisfaction in full on July 30th, 1942, of mortgage dated November 28th, 1941, and registered December 4th, 1941, securing £400.

G. T. Bellamy & Co., Ltd.—Satisfaction in full on July 28, 1942, of debenture dated July 25th, 1940, and registered August 5th, 1940. According to the register of mortgages the debenture registered August 5th, 1940, originally secured £200.

Nox Electric Lamp Co., Ltd.—Particulars filed of £1,800 debentures authorised July 25th, 1942, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Powell & Lee, Ltd.—Assignment on July 29th, 1942, of proceeds of certain contracts, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Dowsing Company (Electrical Engineers), Ltd.—Satisfaction to the extent of £4,500 on June 30th, 1942, of series of debentures authorised July 16th, 1937, and registered July 19th, 1937, securing £5,000.

Bankruptcies

H. Rose (Rose Electrical Service), electrical dealer and contractor, 158, Soho Road, Handsworth, Birmingham.—Last day for receiving proofs for dividend September 1st. Trustee, Mr. F. E. Bendall, 48–50, Exchange Buildings, New Street, Birmingham 2.

H. W. Dinsdale, electrical engineer, 3, Clarence Road, Ipswich.—Public examination October 2nd at the Shirehall, St. Helen's, Ipswich.

STOCKS AND SHARES

TUESDAY EVENING.

THE influence which the war nowadays exercises over Stock Exchange markets is seen more in the expansion or curtailment of business, according to the character of the news, than in the actual fluctuations in prices of stocks and shares. When the news from one or other of the fronts looks a little more cheerful, business in all the markets makes prompt response. On the other hand, events such as, for example, those connected with the continued advance of the enemy into the Caucasus, tend to lay a hand of restraint upon any activity, investment or speculative. It will be gathered from this that prices in the Stock Exchange markets suffer little damage from enemy action. Gilt-edged quotations are maintained. The industrial market continues to be the principal theatre of demand for money which, looking to after-the-war prospects, is content to accept a comparatively modest rate of return on the basis of the present-paid dividends.

India

The news from India led to a little selling of shares in the Calcutta and Madras industrial undertakings. Prices were lowered, more, perhaps, as a matter of precaution than by reason of any particular pressure to realise the shares. The gravity of the situation caused, for a time, by the intransigent attitude of Gandhi, led to the withdrawal of buying orders. Upon the subsiding of the rioting, prices were restored to the same levels as those which previously obtained. Calcutta Electric Supply are 9d. better, at 24s. 6d. A certain amount of hesitation naturally prevails in regard to the outlook for Indian utility undertakings.

Rangoon Electric 6 per cent preference shares continue to be quoted in the neighbourhood of 10s., and the company's 4 per cent. first mortgage debenture stock stands nominally at about 65.

Southern Railway stocks are, if anything, a trifle easier on the week. The only change in London Passenger Transport shares is a rise of a point, to 113½ in the 4½ per cent. " A " stock.

Home Electricity Supply

Home electricity supply shares hold their previous levels and declaration of the interim dividends, most of them at the same rates as those of a year ago, assists to keep the list very steady. The absence of statistics which, in the ordinary way, would be furnished by the yearly accounts, in no way disturbs the confidence with which holders of Home electricity supply shares regard their securities. A mild doubt is occasionally heard in the market as to the wisdom of withholding salient figures relating to balance-sheets and profit and loss accounts. The Government's idea is, of course, to prevent publication of any hint that might conceivably be of service to the enemy, but the ban is carried to such lengths as to evoke an occasional query as to whether it might not be usefully relaxed to some extent.

Yorkshire Electric Conversion

The Yorkshire Electric Power Co. announces that 71 per cent. of the £550,000 5 per cent. redeemable debenture stock in issue has been converted into 3½ per cent. redeemable debenture stock at 100. The company left its lists open a few days longer than was at first notified in order to allow for receipt of subscriptions from holders who had changed their addresses. The balance of issue, £159,500—that is to say, 29 per cent. —will be taken up by the guarantors at par, and this unconverted portion will be repaid to the present holders, on November 1st next, at 102 plus interest. It is reasonable to suppose that when the new 3½ per cent. becomes marketable the price will command a small premium.

Overseas

In the Foreign group, Brazilian Tractions, after touching nearly 18, reacted to 17¼. Mexican Light & Power first mortgage bonds at 90 have more than recovered the interest deduction, and the company's other issues are better on the week. In the Canadian list, Montreal Power at 23½ show a fall of a point. On the other hand, Shawinigan Power is up a dollar, at 15½.

The Investor's Problem

One of the present-day problems confronting the holder of shares is to determine whether it is wiser to accept the current high prices, or to retain his shareholdings in the expectation of still better levels being attained. There are occasional reactions from the best, but these occur too rarely for them to disturb the mind of any but a nervous capitalist, large or small. The Government has complete control of the money market, and by resolutely closing the door to fresh issues, forces capital to seek the existing channels in which money can be employed. On the other hand, dividends are more or less stabilised at their previous rates through the incidence of E.P.T.

Prices and Prospects

Anomaly arises, therefore, from a situation in which capital value has every prospect of improving while, at the same time, the income derived from the stocks and shares has little prospect of increasing. While the cost of living constantly rises, the stockholder finds that he is no better off in dividend receipts, though he nominally benefits by a capital

(*Continued on page* 254)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend 1939–40	Dividend 1940–41	Middle Price Aug. 18	Rise or Fall	Yield £ s. d.
Home Electricity Companies					
Bournemouth and Poole	12½	12½	50/–	–1/16	5 0 0
British Power and Light	6	6	27/–	..	4 9 0
City of London	7	7	27/6	..	5 1 9
Clyde Valley	8	8	40/–	..	4 0 0
County of London	8	8	35/–	–1/16	4 11 6
Edmundson's:					
7% Pref.	7	7	33/9	–9d.	4 3 0
Ord.	6	6	28/–	..	4 5 9
Elec. Dis. Yorkshire	9	9	42/–	..	4 5 9
Elec. Fin. and Securities	12½	12½	48/9	..	5 2 6
Elec. Supply Corporation	10	10	45/–	..	4 9 0
Isle of Thanet	2	Nil	11/3	..	—
Lancs. Light and Power	7½	7½	33/9	..	4 9 0
Llanelly Elec.	5½	5½	22/6	..	4 17 9
Lond. Assoc. Electric	4½	4	19/6	..	4 2 1
London Electric	6	6	25/–	..	4 16 0
London Power Red. Deb.	5	5	105½	..	4 14 7
Metropolitan E.S.	8	8	35/–	..	4 11 6
Midland Counties	8	8	38/9	..	4 2 6
Mid. Elec. Power	9	9	42/–	..	4 5 9
Newcastle Elec.	7	7	28/9	..	4 17 5
North Eastern Elec. Ordinary	7	7	31/3	..	4 9 7
7% Pref.	7	7	33/6	–6d.	4 3 7
Northampton	10	10	47/–	..	4 5 1
Notting Hill 6% Pref. (£10)	6	6	9	..	—
Northmet Power:					
Ordinary	7	7	32/6xd	–1/–	4 6 2
6% Pref.	6	6	31/–	..	3 17 5
Richmond Elec.	6	6	25/–	..	4 16 0
Scottish Power	8	8	38/3	..	4 3 9
Southern Areas	5	5	20/–	..	5 0 0
South London	7	7	26/6	..	5 5 8
West Devon	5	5	22/6	..	4 9 0
West Glos.	4½	3½	20/–	..	3 10 0
Yorkshire Elec.	8	8	40/–	..	4 0 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	4/3	..	—
Calcutta Elec.	7*	7*	24/6	+9d.	5 14 3
Cawnpore Elec.	10	10	26/3	..	7 12 4
East African Power	7	7	27/–	..	5 3 8
Jerusalem Elec.	7	5	17/6	..	5 14 4
Kalgoorlie (10/–)	7½	5	7/6	..	6 13 4
Madras Elec.	6*	4*	18/9	..	4 5 4
Montreal Power	1½	1½	23½	–1	6 7 8
Palestine Elec. "A"	Nil	4*	21/3	..	3 15 3
Perak Hydro-elec.	6	7	7/6	..	—
Shawinigan Power	83cts.	90cts.	15½	+1	—
Tokyo Elec. 6%	6	6	13½	..	—
Victoria Falls Power	15	15	72/6	..	4 2 8
Whitehall Inv. Pref.	5	5	15/9	..	6 7 0

Company	Dividend 1939–40	Dividend 1940–41	Middle Price Aug. 18	Rise or Fall	Yield £ s. d.
Public Boards					
Central Electricity:					
1950–70	5	5	109	..	4 11 9
1955–75	5	5	115	..	4 7 0
1951–73	4½	4½*	107½	..	4 3 7
1963–93	3½	3½	103½	..	3 7 8
1974–94	3½	3½	99½	..	3 5 4
London Elec. Trans. Ltd.	2½	2½	96	..	2 12 1
London & Home Counties 1955-75	4½	4½	109	..	4 2 7
Lond. Pass. Trans.:					
A	4½	4½	113½	+1	3 19 4
B	5	5	114½	..	4 7 4
C	3	2⅞	45	..	6 7 9
West Midlands J.E.A. 1948–68	5	5	110	..	4 11 0
Telegraph and Telephone					
Anglo-Am. Tel.:					
Pref.	6	6	110	..	5 9 1
Def.	1½	1½	26	..	5 15 5
Anglo-Portuguese	8	8	18/3	..	8 15 4
Cable & Wireless:					
5½ Pref.	5½	5½	102½	–1	5 7 4
Ord.	4	4	59	–½	6 15 7
Canadian Marconi $1	Nil	4cts.	5/–	..	3 7 0
Globe Tel. & Tel.:					
Ord.	8½*	5*	27/6	..	3 12 9
Pref.	6	6	27/6	..	4 7 5
Great Northern Tel.:					
(£10)	Nil	Nil	15½	..	—
Inter. Tel. & Tel.	Nil	Nil	3	..	—
Marconi-Marine	7½	7½	28/9	..	5 4 4
Oriental Tel. Ord.	16	10	46/3xd	–9d.	4 6 7
Telephone Props.	6	Nil	11/3	..	—
Tele. Rentals (5/–)	10	10	9/–	..	5 11 1
Traction and Transport					
Anglo Arg. Trans.:					
First Pref. (£5)	Nil	Nil	3/–	..	—
4% Inc.	Nil	Nil	8½	..	—
Brit. Elec. Traction:					
Def. Ord.	45	45	920	..	4 17 6
Pref. Ord.	8	8	170	..	4 14 2
Bristol Trams	8	10	46/3	..	4 6 4
Brazil Traction	$1	50c	17½	..	—
Calcutta Trams	8	5½	18/3	..	6 0 9
Cape Elec. Trams	5	5	20/–	..	5 0 0
Lancs Transport	10	10	43/9	..	4 11 4
Mexican Light:					
1st Bonds	5	5	90	+2¾	5 11 1
Rio 5% Bonds	5	5	101	..	4 19 0
Southern Rly.:					
5% Prefd.	5	5	65	..	7 13 10
5% Pref.	5	5	105½	–½	4 14 9
T. Tilling	10	10	47/–	–6d.	4 5 3
Tilling & B.A.	7*	6½*	55/–	..	2 7 3
West Riding	10	10	38/6	–1/–	5 4 0

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend 1939–40	Dividend 1940–41	Middle Price Aug. 18	Rise or Fall	Yield p.c. £ s. d.
Equipment and Manufacturing					
Aron Elec. Ord. ..	Nil	7½	25/–	..	6 0 0
Assoc. Elec. :					
Ord.	10	10	46/3	..	4 6 6
Pref.	8	8	39/6	..	4 1 0
Automatic Tel.&El.	12½	12½	52/6	..	4 15 3
Babcock & Wilcox	11	11	42/6	..	5 3 6
British Aluminium	10	10	43/9	..	4 11 6
British Insul. Ord.	20	20	93/9	..	4 5 6
British Thermostat (5/–)	18½	18½	16/3	..	5 13 10
British Vac. Cleaner (5/–)	12½*	10	13/9	..	3 12 9
Brush Ord. (5/–) ..	Nil	6	6/–	..	5 0 0
Callender's ..	15	15	72/6	..	4 2 9
ChlorideElec.Storage	15	15	72/6	..	4 2 9
Cole, E. K. (5/–) ..	Nil	7	14/–	..	2 10 0
Consolidated Signal	17	17	70/–	..	4 17 2
Crabtree (10/–) ..	17½	17½	31/3	+⅛	5 12 0
Crompton Parkinson Ord. (5/–) ..	30	20	21/3	..	4 14 0
E.M.I. (10/–) ..	Nil	6	17/–	..	3 10 10
Electric Construction	10	10	34/6	..	5 16 0
Enfield Cable Ord.	12½	12½	53/9	..	4 13 0
Elecl. Switchgear (10/–)	10	10	20/–	..	5 0 0
English Electric ..	10	10	41/3	..	4 17 0
Ensign Lamps (5/–)	25	25	16/3	..	7 13 10
Ericsson Tel. (5/–)	22*	20*	40/–	..	2 10 0
Ever Ready (5/–)	40	40	32/3	..	6 4 0
Falk Stadelmann	7½	7½	23/9	..	6 6 4
Ferranti Pref. ..	7	7	27/6	..	5 1 10
G.F.C. :					
Pref.	6½	6½	33/9	..	3 17 0
Ord.	20	17½	80/–	..	4 7 6
Greenwood & Batley	15	15	30/–	..	10 0 0
Hall Telephone(10/–)	10	12½	20/–	..	6 5 0
Henley's (5/–) ..	20	20	22/6	..	4 9 1
4½% Pref. ..	4½	4½	22/6xd	..	4 0 0
Hopkinsons ..	15	15	50/–	..	6 0 0
India Rubber Pref.	5½	5½	20/–	..	5 10 0
Intl. Combustion..	32½	30	107/6	..	5 12 0
Johnson & Phillips	15	15	60/–	..	5 0 0
Lancashire Dynamo	20	20	70/–	..	5 14 4
Laurence, Scott(5/-)	15	12½	9/6	..	6 11 7
London Elec. Wire	7½	7½	28/3	..	5 6 2
Lucas, J.	15	15	65/–	–¼	4 12 4
Mather & Platt ..	10	10	40/–xd–9d.		5 0 0
Met.Elec.Cable Pref.	5½	5½	21/3	..	5 3 6
Murex	20	20	97/6	..	4 2 0
Pye Deferred (5/–)	25	25	17/–	+9d.	7 7 1
Revo (10/–) ..	20	17½	28/9	..	6 1 9
Reyrolle	12½	12½	58/9	..	4 5 0
Siemens Ord. ..	7½	7½	26/3	..	5 14 3
Smith, S. (1/–) ..	50	37½	7/–	..	5 7 2
Strand Elec. (5/–)	2	4	4/6	..	4 9 0
Switchgear & Cowans (5/–) ..	15	10	10/–	..	5 0 0
T.C.C. (10/–) ..	5	5	15/–	..	2 6 8
T.C. & M... ..	10	10	43/9	..	4 11 4
Telephone Mfg.(5/–)	9	9	9/6	..	4 14 9
Thorn Elec. (5/–)..	20	20	15/–xd+6d.		6 13 4
Tube Investments	23⅓	20	85/–	..	4 14 1
Vactric (5/–) ..	Nil	Nil	6/–	..	—
Vickers (10/-) ..	10	10	16/6	..	6 1 3
Ward & Goldstone (5/–)	20	20	19/–	..	5 5 3
Westinghouse Brake	10	10	47/6	..	4 4 2
Walsall Conduits(4/-)	55	55	37/6	+¼	5 17 4
West, Allen (5/–)	7½	7½	5/9	..	6 10 5

* Dividends are paid free of Income Tax.

Stocks and Shares (*Continued from page* 252)

increment which, after all, affords little, if any, assistance when it comes to paying the bills. So far as observation goes, the Stock Exchange markets are in the position where the pointers indicate probable improvement in prices.

Walsall Conduits are ¼ up at 37s. 6d. and Crabtrees are similarly better at 31s. 3d. Mather & Platt eased off to 40s., Lucas to 65s. Pye deferred came into notice on yield considerations and hardened to 17s., which brought them into line with E.M.I. shares, the recent activity in which has to some extent subsided.

Shares on Offer

On the ordinary shares which are obtainable in the market for home electricity supply shares, the yields range from 4 per cent. on Yorkshire Electric to 5 per cent. on City of London Electric and Bournemouth & Poole. London Electric ordinary are on offer at 25s. to pay £4 16s. 0d. per cent.; Southern Areas at 20s. 6d. give 4⅞ per cent.; Metropolitan at 35s. return £4 11s. 5d. In the Provincial group, a few Bournemouth & Poole came to market at 51s. The shares at 50s. return 5 per cent. on the basis of the last paid 12½ per cent. dividend. Two or three thousand Scottish Power ordinary are obtainable at 38s., the return in this case being £4 4s. 3d. per cent. It is of interest to compare these yields with the return offered by General Electric ordinary. Shares can be bought at 80s. 9d. These give £4 6s. 6d. per cent. assuming maintenance of the 17½ per cent. dividend.

Four per cent. Return

The yields on electricity supply preference shares range between £3 13s. 6d. from South Metropolitan Electric 4 per cents, of which 5,000 are obtainable at 21s. 9d., to 4¼ per cent. available from Electric Finance 7 per cent. preference at 32s. 6d. Others in the list give an average return of 4 per cent. to a little over. Some of the electric lighting 6 per cent. preference, *e.g.*, Northmet at 31s. and Midland Counties at 30s. 9d., pay two or three shillings less than 4 per cent. on the money. Llanelly sixes, on offer at 30s., give 4 per cent. at that price. While 4 per cent. seems a meagre yield when income tax is 10s. in the £, this consideration does not stop investment so long as the capital is secure.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—TOWNSVILLE, QUEENSLAND.—November 19th. City Council. Water-tube boiler of not less than 36,000 lb. per hr. evaporative capacity at a pressure of 200 lb. per sq. in. Specifications (£1 1s.) from A. Robertson, town clerk.

Belfast.—August 26th. Commissioners for the Tuberculosis Committee. Electric lighting installation at the Municipal Sanatorium, Whiteabbey. Specifications etc., from the City Surveyor's Office (Architectural Section, Room 92), City Hall.

East Riding.—August 31st. County Education Committee. Electric lighting and heating installations in 40 air-raid shelters. Specifications from county architect, County Hall, Beverley. Tenders to Clerk of Council.

Normanton.—August 31st. Urban District Council. One 2-ton electric vehicle complete with battery charger (July 31st).

Orders Placed

Australia—P.M.G.'s DEPARTMENT.—Coaxial cable. Contract 4347 (£3,567).—Telegraph Construction & Maintenance Co., Ltd. Cable, Contract 5358 (£3,857).—Callender's Cable & Construction Co., Ltd. Long line equipment maintenance parts, Contract 5197 (£5,340) and receivers, etc., Contract 4864 (£1,930).—Standard Telephones & Cables Pty., Ltd.

Chester-le-Street.—Rural District Council. Accepted. Electrical installations in thirteen public shelters.—B. L. Oliver.

Northumberland. — Education Committee. Accepted. Electric lighting installation at Hauxley Radcliffe Infants' School (£75).—F. R. Little.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Altrincham.—Houses; E. M. Slater, borough surveyor, Town Hall.

Ashton-under-Lyne. — Communal centre; A. T. Kemp, borough surveyor, Municipal Buildings.

Brandon.—British Restaurants; F. Hedley, U.D.C. offices, Brandon, Co. Durham.

Brierley Hill. — Cleansing station, Little College Street, for Staffordshire C.C.; A. J. Crump & Son, Ltd., builders, Aston Road, Dudley.

Broadheath (Ches.).—Works canteen; Blackwells & National Roofings, Ltd., Barlow Road.

Bromsgrove.—Houses, Monsieurs Hall Lane, Dodford; J. Tibbetts, Dodford, Bromsgrove.

Carlisle.—Building works for Town Council; J. Laing & Son, Ltd., building contractors, Dalston Road.

Cheetham.—Workrooms, showrooms, shops, offices and restaurant; L. Ledger, Paramount Garages, Ltd., 1, Cheetham Hill Road.

Club headquarters, Cheetham Hill Road; A. Isaacs, architect, 136, Middleton Road, Crumpsall, Manchester, 8.

Clayton.—Works additions; C. Hartley, architect, 128, Buxton Road, Great Moor, Stockport.

Consett.—Ballroom for Hindmarsh Enterprises, Ltd., Gibson Street, Consett.

Coventry.—School huts, Whitley (£4,000); city engineer.

Dagenham. — Civic restaurant, Chadwell Heath; surveyor, Municipal Offices, Central Park, Dagenham.

Edinburgh.—Completion of houses, West Pilton area; city architect.

Gateshead.—Wartime nurseries at several schools; borough engineer.

Shelters at four schools; J. Sutton & Son, builders, Tinn Street, Gateshead.

Gomersal.—Works canteen; Dawson Bros., Ltd., bottlers' engineers, Dewsbury Road, Leeds.

Haslemere.—Adaptation of premises at Hindhead for use as British Restaurant; G. H. Walker, acting clerk, Council Offices, Haslemere.

Herefordshire.—Hut at Ross for youth movement (£1,100); county architect, County Offices, Bath Street, Hereford.

Heywood.—Control room for N.F.S.; borough surveyor, Municipal Buildings.

Huddersfield.—Completion of part of building, Dalton Grosvenor Road School, and erection of huts at Mount Pleasant School; education architect, Education Offices, Peel Street.

Ilford.—Works additions; W. Courtney (Contractors), Ltd.

Manchester. — Workshop reconstruction, Potato Wharf, Liverpool Road for Wood & Hildred; E. A. Newton, architect, Bow Lane, Manchester, 2.

Meridan.—Development of the old Vicarage site, Coleshill, as Civic Centre for R.D.C.; H. Pickering, engineer, Town Hall, Coleshill *via* Birmingham.

Merton and Morden.—Surface shelters, watch rooms, shower baths and drying rooms at N.F.S. stations; surveyor, Morden Hall, S.W.19.

Middlesbrough.—Store, Linthorpe Road, for T. Whatley & Son, Ltd.; Kitching & Co., architects, 21, Albert Road.

Newcastle-on-Tyne.—Factory; A. G. Sinclair, 21, Brantwood Avenue, West Monkseaton, Whitley Bay.

Workshop; Tasker & Child, Trinity Buildings, New Bridge Street.

Canteen, City Road, for Thomas Hedley and Co., Ltd.; R. Bowey, builder, 3, Mason Street, Byker, Newcastle-on-Tyne, 6.

Decontamination centre, Kirk Street; R. G. Roberts, city architect, 18, Cloth Market.

Rotherham.—Central restaurant, borough engineer.

Works additions; Watt & Fergusson.

St. Helens.—Premises, Baldwin Street, for Wigan Trustee Savings Bank, Ltd.

Shropshire. — Cooking depot at Dawley (£1,839), and establishment of nurseries at Oakengates, Wellington and Madeley; A. G. Chant, county architect, 5, Belmont, Shrewsbury.

Southall.—Café, The Broadway (£850); borough engineer.

Saw mill additions; N. Y. Theodoulou.

Stretford.—Canteen, Trafford Park Road; Co-operative Wholesale Society, Ltd.

Canteen; British Oil & Cake Mills.

Sussex.—School canteens (£2,550) and huts (£1,700); West Sussex county architect, Chichester.

Swalwell (Durham).—Miners' canteen, Emma Colliery; Shield Bros., Back Park Terrace.

Tottenham. — Alterations, Derby Works; Power Flexible Tubing Co., Ltd.

Wellington (Salop).—Houses for R.D.C.; J. B. Cooper, architect, Coleridge Chambers, 177, Corporation Street, Birmingham, 4.

Wigan.—Works extensions; W. J. Bickerstaff & Son, builders, Seven Stars Bridge.

Workington.—Surface shelters on selected sites, with electrical work; A. B. Cooper, borough surveyor, Town Hall.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1940

15129. "Method of and apparatus for controlling searchlights." Sperry Gyroscope Co., Ltd., R. H. Nisbet and D. G. Walters. October 10th, 1940. (546664.)

15401. "Electrical insulating material, and method of producing the same." Norton Co. October 27th, 1939. (546641.)

15403. "Method of making electrical insulating material." Norton Co. October 27th, 1939. (546643.)

15471. "Apparatus for the electrical separation of suspended particles from gaseous fluids." W. Deutsch. October 19th, 1940. (546617.)

15506. "Manufacture of tubing or sleeving of fabric formed of threads or cords." Pirelli-General Cable Works, Ltd., H. Barron, F. Halestrap, A. McAuley and H. P. Grinyer. October 21st, 1940. (546644.)

15937. "Phonographic apparatus." Radio Corporation of America. October 31st, 1939. (546592.)

16471. "Excitation of polyphase dynamo-electric machines." A. L. Wallof. November 14th, 1940. (546594.)

16526. "Maximum average rate indicator." English Electric Co., Ltd., G. Tilstone and E. Clemence. November 15th, 1940. (Cognate application, 11350/41. (546688.)

17926. "Air or gas blast electric switches." J. A. Henley and Metropolitan-Vickers Electrical Co., Ltd. December 20th, 1940. (546625.)

18044. "Means for controlling the excitation of synchronous dynamo-electric machines." E. Barraclough and P. A. H. Mossay. December 23rd, 1940. (546690.)

1941

74. "Aircraft landing systems." Standard Telephones & Cables, Ltd. January 3rd, 1940. (546668.)

724. "Telephone systems." Automatic Telephone & Electric Co., Ltd., and G. W. Thompson. January 18th, 1941. (546600.)

725. "Fuse carriers for cartridge-type fuses." V. Hope. January 18th, 1941. (546604.)

967. "Electric carrier wave signalling systems." Standard Telephones & Cables, Ltd., and B. B. Jacobsen. January 24th, 1941. (546693.)

984. "Soldering apparatus." Standard Telephones & Cables, Ltd. (trading as Stanelco Products), and G. L. Ward. January 24th, 1941. (546695.)

985. "Electric soldering irons." Standard Telephones & Cables, Ltd. (trading as Stanelco Products), and G. L. Ward. January 24th, 1941. (546696.)

1118. "Electric power systems." Westinghouse Electric International Co. January 24th, 1940. (546653.)

2284. "Control of alternating-current commutator motors." B. Schwarz. February 19th, 1941. (546699.)

3434. "Volume range control systems." Radio Corporation of America. March 30th, 1940. (546703.)

3689. "Systems for maintaining a constant mean frequency in transmissions by frequency modulated carrier wave." Electrical Research Products, Inc. March 30th, 1940. (546677.)

10261. "Horseshoe magnet of material of high coercive force." Landis & Gyr Soc. Anon. August 31st, 1940. (546606.)

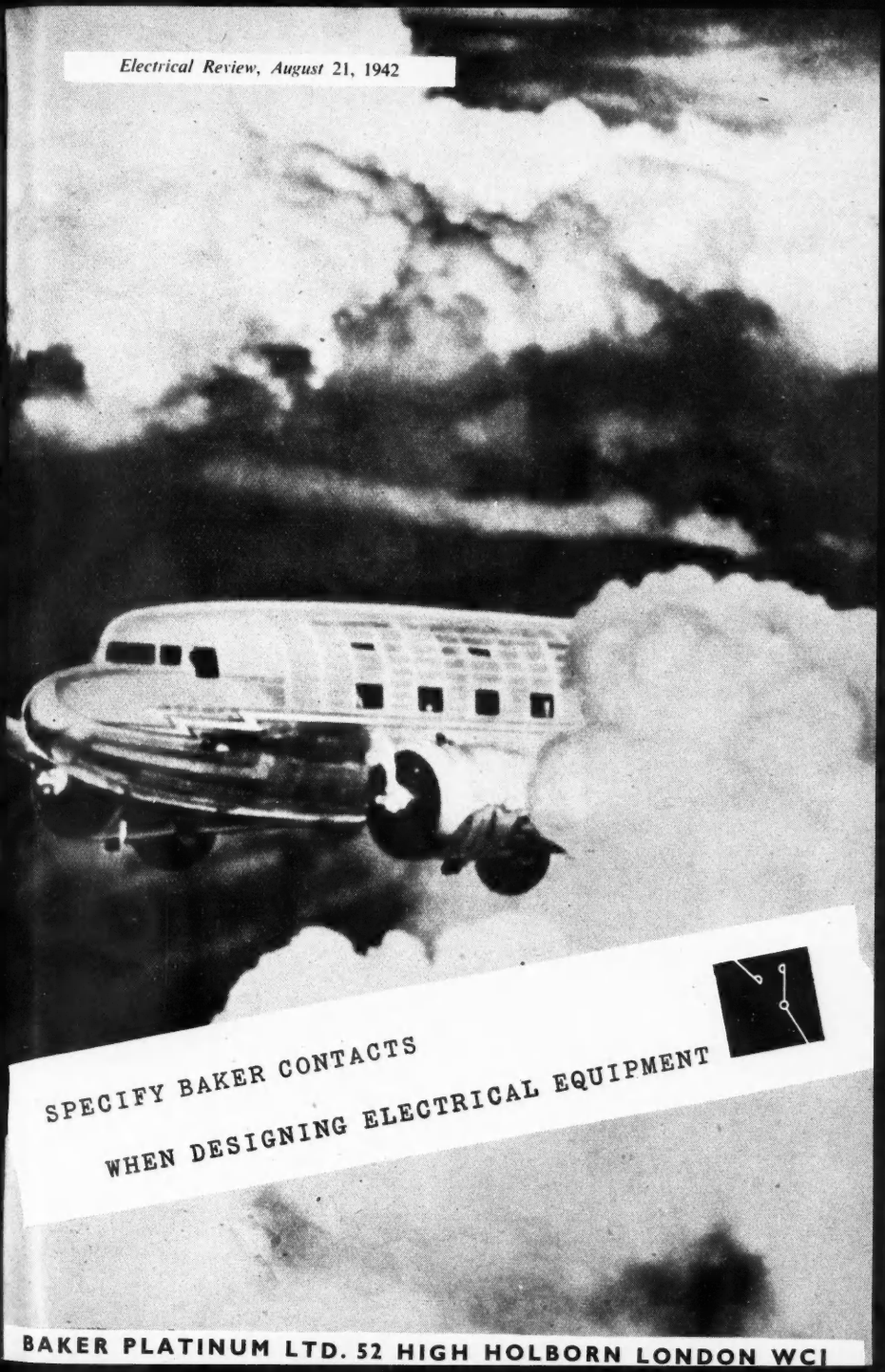
10340. "Air-conditioning apparatus." British Thomson-Houston Co., Ltd. August 14th, 1940. (546607.)

10710. "Vehicle headlamps." British Thomson-Houston Co., Ltd. August 24th, 1940. (546608.)

11960. "Photo-electric barrier layer cells." Sangamo Weston, Ltd. May 3rd, 1941. (546611.)

Amended Specification

528806. "Thermionic valve circuits such as multivibrators, etc." R. Calvert.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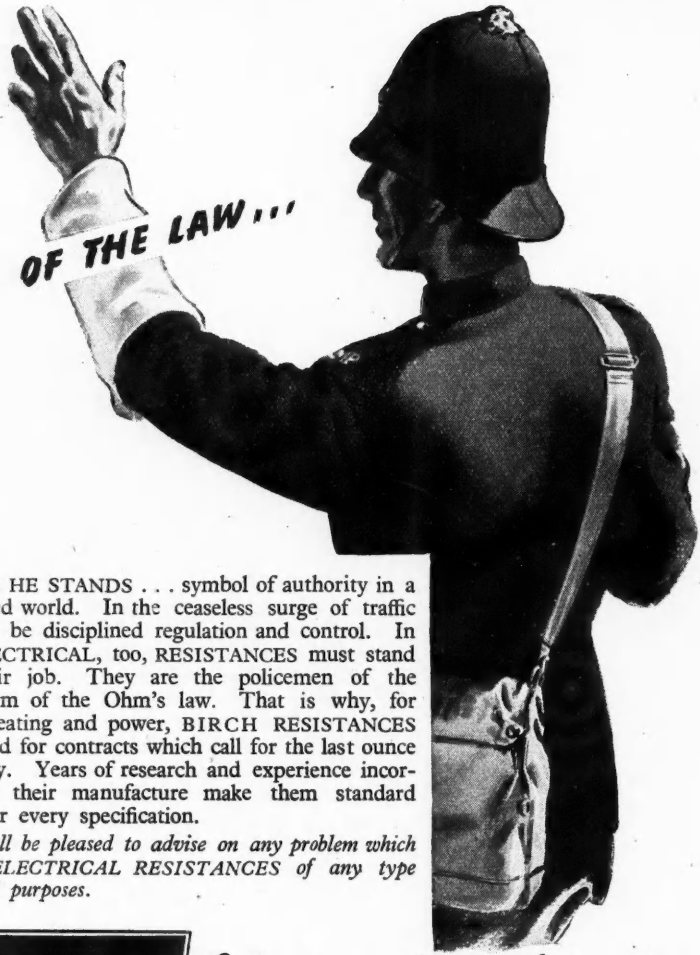

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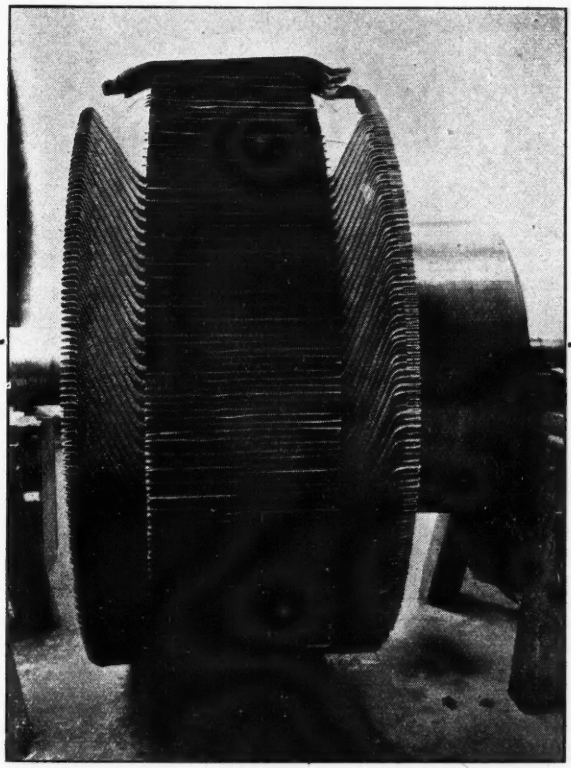

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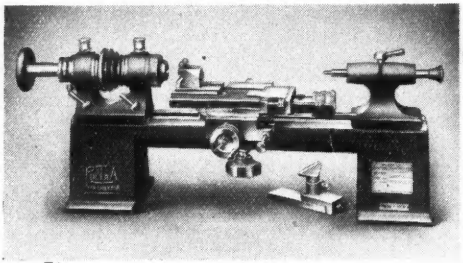

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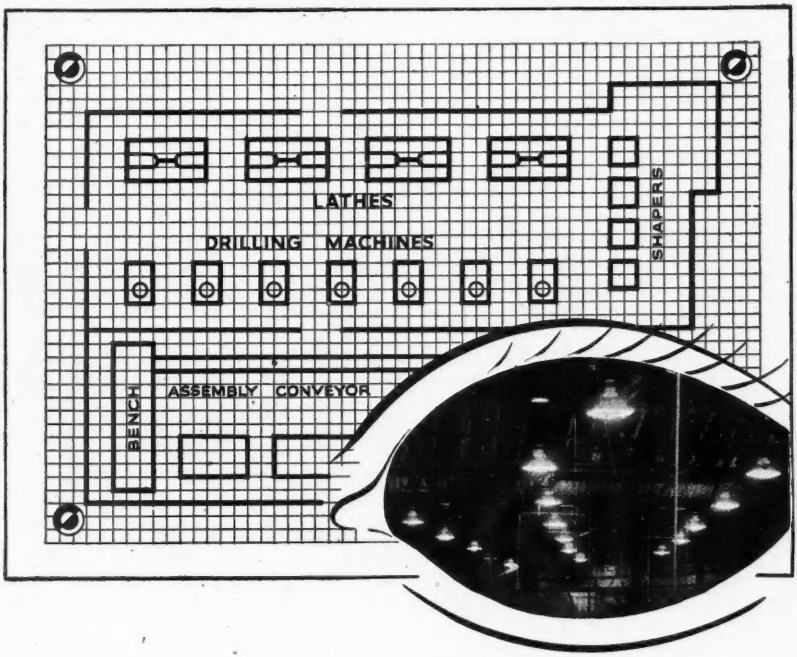

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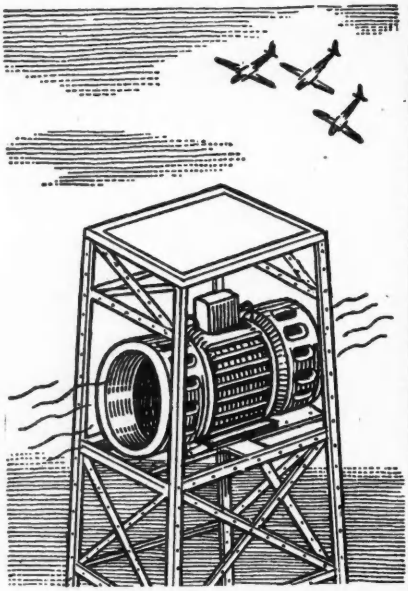

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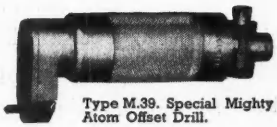

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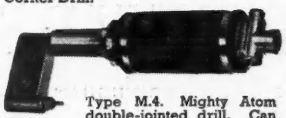

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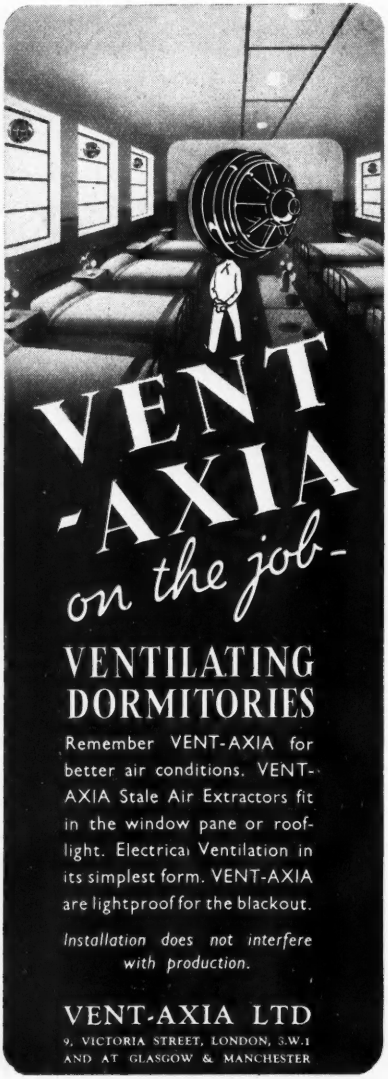

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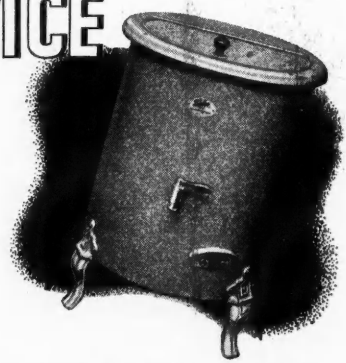

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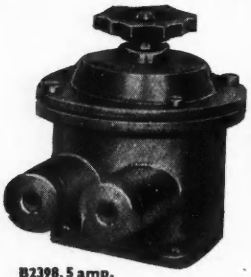

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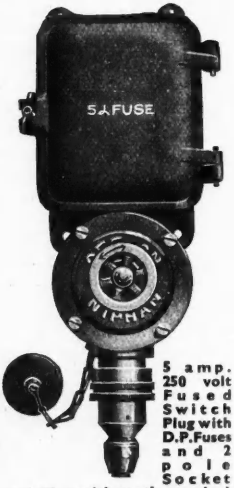

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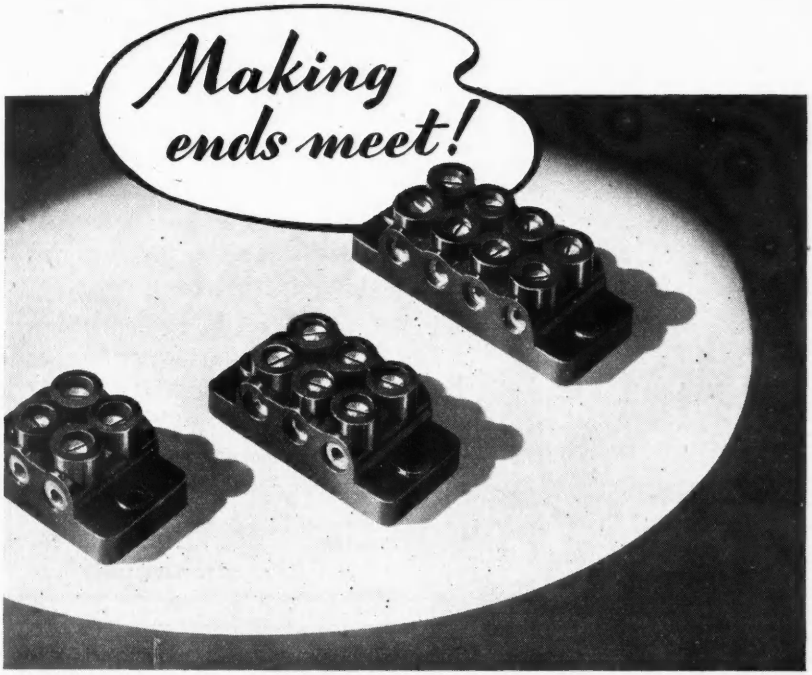

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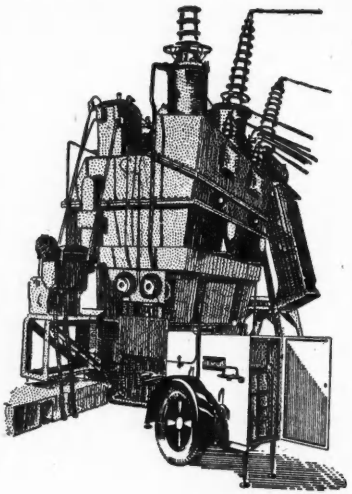

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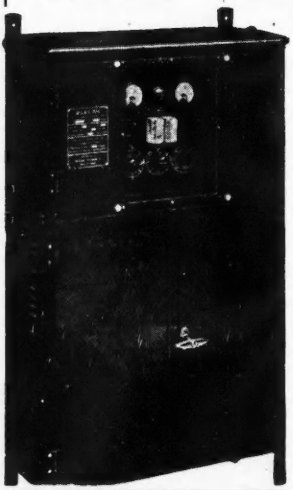

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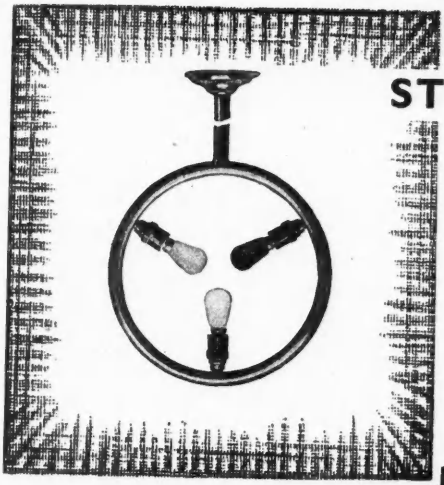

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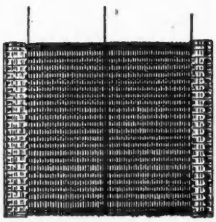

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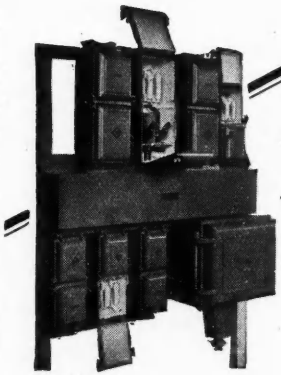

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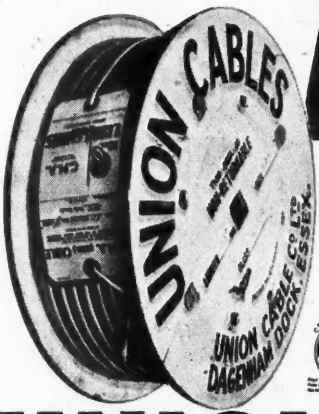

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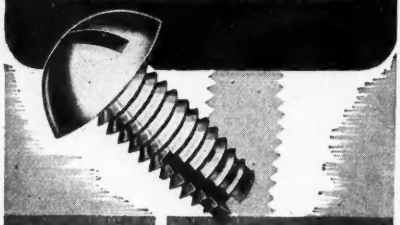

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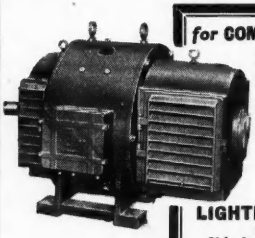

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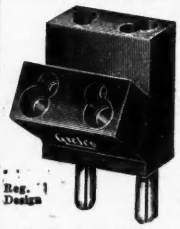

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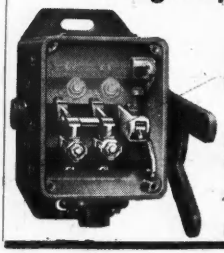

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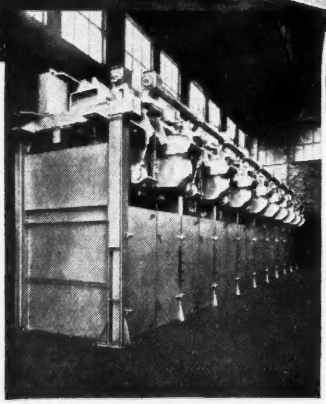

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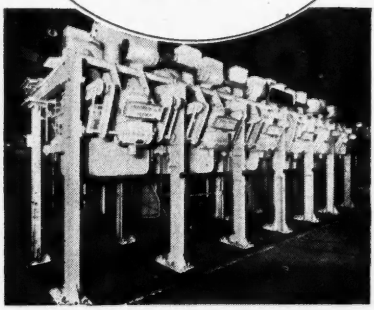

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